



Case No. 146.1335

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s) : Cortes, J. et al.  
Serial No. : 09/463,705                      Group Unit : 1652  
Filed : February 23, 2000                      Examiner : Rao, M.  
For : BIOSYNTHESIS AND TRANSFER GENES OF 6-  
DESOXYHEXOSES IN SACCHAROPOLYSPORA ERYTHRAEA  
AND IN STREPTOMYCES ANTIBIOTICUS AND THEIR USE

Statement Under 37 C.F.R. §1.821(f) or §1.825(b)

Assistant Commissioner of Patents  
Washington, D.C. 20231

Dear Sir:


I hereby certify that:

- ☒ [X] The paper Sequence Listing submitted herewith and computer readable Sequence Listing attached hereto are identical (37 C.F.R. §1.821(f)).
- ☐ [ ] The substitute paper Sequence Listing and substitute computer readable Sequence Listing submitted herewith are identical. No new matter is included (37 C.F.R. §1.825(b)).

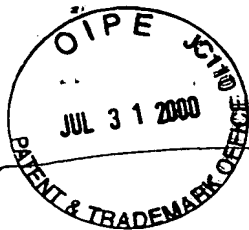
Respectfully submitted,

BIERMAN, MUSERLIAN AND LUCAS, L.L.P.

Date: 7/31/00

By:   
Charles A. Muserlian  
Reg. No. 19,683

BIERMAN, MUSERLIAN AND LUCAS, L.L.P.  
600 Third Avenue, 28<sup>th</sup> Floor  
New York, NY 10016  
(212) 661-8000  
(212) 661-8002 Telecopier



#10

# SEQUENCE LISTING

<110> Cortes, J  
Fromentin, C  
Gaisser, S  
Leadlay, P  
Mendez, C  
Michel, J-M  
Raynal, M-C  
Salah-Bey, K  
Salas, J

<120> BIOSYNTHESIS GENES & TRANSFER OF 6-DESOXY-HEXOSES IN  
SACCHAROPOLYSPORA ERYTHRAEA AND IN STREPTOMYCES  
ANTIBIOTICUS AND THEIR USE

<130> 146.1335

<140> 09/463705

<141> 2000-02-23

<150> PCT/FR98/01593

<151> 1998-07-21

<150> 98/07411

<151> 1988-06-12

<150> 97/09458

<151> 1997-07-25

<160> 61

<170> PatentIn Ver. 2.1

<210> 1

<211> 3439

<212> DNA

<213> Saccharopolyspora erythraea

<220>

<221> CDS

<222> Complement((48)..(1046))

<223> /function= "involved in the biosynthesis of  
mycarose" /gene= "eryBII"

<220>

<221> CDS

<222> Complement((2322)..(3404))

<223> /function= "involved in the biosynthesis of  
desosamine" /gene= "eryCII"

<400> 1

gcttcacgct caccagccgt atcctttctc ggttcctctt gtgctcactg caaccaggct 60

tccggcgccg cgccgccgga ggccaccgcy ggaagatct cgtccagttc ggacagcgcc 120

tgctcgcca gggatcatgc ggacgccttc agcgaggagt cgagctgctc ggggggttcgc 180

gggccgatga cggcgccggc gatgccgggc cgggacagca cccatgcgag cccacctcg 240

gccgggtctt cgccgaggtt gcggcagaac ttctcgtagg cctcgatcgc cgggcgcagg 300

gacggcaaca gcacctgcgc acggccctgc gccgacttca ccgcggtgcc cgcggccagc 360  
 ttctccagcg ctccgctgag caggccgccg tgcagcggcg accaggcgaa gacgccgagc 420  
 ccgtaggcct gcgcggcggg cagcacctcc agctcggcgt gccggaccgc caggttgtag 480  
 aggcactggt gggagaccat gccaggggag tggcggcggg cggcggttctc ctgcgcggcg 540  
 gcgatgtgcc agcccgcgaa gttcgacgag ccgacgtagg agaccttgcc gctggcgacg 600  
 aggctgtcca tggcctgcca cacctcgtcc cacggcgcgg accggtcgat gtggtgcatc 660  
 tggtagacgt cgatgtggtc gacgcccagc ctgcgcagcg atccctcgca ggaggcgatg 720  
 atgtgccgcg ccgacagccc gctgtcgttg acgcgctcgc tcattctgcc gccgaccttg 780  
 gtcgccagca cgggtgtcctc gcgcgcgtcc cgcacctggg ccagccacct gccaccagc 840  
 tcctcgggtgt ggcccttgta gagccgccag ccgtacatgt cggcggtgtc gaggcagttg 900  
 atgccgcggt cccgggctg gtccatcagg cgcagcgcgt cgtcgtcctc gacgcgtccg 960  
 ctgaagtcca ccgtgccgag ccagagcctg ctggtgagca gcgcggaacg cccgagccgc 1020  
 acgtgcgtcg cggcgctcgtt ggtcatcgtg gttctctcct tcctgcggcc agttcctcgc 1080  
 agatgccgac gacctcggcc ggtgacggct ccgcgagcat gtcgtcgcgc atccgcgcgc 1140  
 cgccggcgcg gtgggcccgg tcgtcgagga cccgcttcac cgactcccgg agctggtcgg 1200  
 gggtcagctc gggcacgggc agcgcgatcc ccgccccgaa ttctgcgtg cgtgcgcgc 1260  
 gcacgccggt gtcccagccg tcgggcagga tcacctgcgg cacgccgtgg atcgccgcgg 1320  
 tgtgccagct cccgggtccg ccgtggtgca ccgtcgccgc gcaggtcggc agcagcgcgt 1380  
 gcatcgggac gaagccgacc gtgcggacgt tgtccgggat gttcgcgacg ccttctagct 1440  
 gctgcgcgtc gaaggtcgcg atgatctcgg cgtcgacgtc gccgacggca cccagcagct 1500  
 cctcgatgga gacctgcccg atgctgttct cgcggctgga gatcccgagc gtgaggcaca 1560  
 cgcggcggcg ctccggctcg tcgtgcagcc attccggcac cacggacggc ccgttgtagt 1620  
 cgacgtagcg catcccgacg gtcttcaggc cgggtgtcag cctgatcgcg gccggggcgg 1680  
 ggtcgatcgt ccaactgccc acgaccacct cctcgtcgaa ggccggggcc ccgtacttct 1740  
 ccagcgtcca ggtgagccac tcggcgagcg ggtcctcccg gtgctcctcc ggctggtcgg 1800  
 gcagcaggcc gaggaagttc tgccgcgccc ggggtggtgat gtcgggtccc cacagcagcc 1860  
 gcgcgtgcgg cgttcgggtc accgccgccg cgatgggcgc ggcgaagggt agcggctccc 1920  
 agatgaccag gtcgggcccgc cacttcgggc agaacgagac catgccttcg atgagcgtgt 1980  
 ccgggctcat cagggcgtag aaggtcgggg tgagcacggt ctgcatgccc agcaggtgct 2040  
 cccaggtcaa ggtggcgggg tcccgcctcg tgaagtccag gtcgggacg tagtcgatga 2100

```

tgctcgtggcc cgcgtgggtc atgaagtcca cgaggctcgac gtcggtgccg accgggacgg 2160
cggtcagccc ggccgcggtg atgtcctcgg tgagcgccgg ggacgcgacc acgcggacct 2220
cgtgccccgc cgcgcggaac gcccatgcga gggggacgag gccgaagagg tggctcttgc 2280
tggccatgga ggagaagacg acgcgcacgc cggttacctc agagctcgac ggggcagcgg 2340
ttggttcccc gcaggacggg tgatcggcgg cgccggacga ccggggccgt gggcgtgagt 2400
ccgggcagcg ccttggccgc ggcccgcagt gcggcggtgg cgagcgcggt gaccagctcc 2460
tccagcctgc cggggtggcc gcgatgtgcc gacagcgcg gcgcggcggtc ggggcgggtcc 2520
acgtcgaggc ggtcggggtc ggccaagacc tccgggtcgc ggttggccgc cgcgacgacg 2580
accacgacct cctcgccttc gccgateacg tgetcgccga gccgcacctc tgcggtggcc 2640
gtgcgccgct ccagggtgaa tgccgggtgc aggcgcagca cctcggcgac ggttcgctgc 2700
gcggcgccgg ggtcgtcggc gatccgttcg gccagccccg gttcggccga gacggccagg 2760
accgcgtcga ccacggtggt cgcggtcacc tcggccccgg cgaacagggc gcgcagtgcg 2820
gggtcggcgg gcagtgcgc gaccgctgct tcggtcaccg cgagctgctg cgggctgagc 2880
tgggcgtcca ggctgacgc ggcgtccac gcggcgccgc gcagcactcc ggctgcgccg 2940
agcacggcgg tcatgccctg caccggtacc tgccaggcga agtcgccgac caggctccagc 3000
cgcgcgcccc cgccggggag cagaccggcg aagctctccg ccagttcccc gacgtcgggg 3060
acctcgcctt cccaggacgc ggcgtgcacg tcccgaacg gctgggcccc ctcggcggggt 3120
ggcgcgcccc cgccccgat ccattccggt gtgcgtccgg tggcgcggggt gaacgcgggg 3180
tcgtcgagca cctgccgggc ggtggcgtgg tcggccacca cccacgtctc ggtgcggctg 3240
cgccgcacac cggactcgcg catcgagcgg taccggcgct gcgggtcgtc gtcgtgtccg 3300
cacagcagca tcgggtaagg gtcgccgttg ctgccgtaac cccagtgcag gccgcggatc 3360
atctggagct gcctgcccag cccggcgcca tcggtcgtgg tcatgaattc cctccgcccc 3420
gccaggcgtc gatgtgccg 3439

```

<210> 2  
 <211> 333  
 <212> PRT  
 <213>

<400> 2  
 Met Thr Thr Asp Ala Ala Thr His Val Arg Leu Gly Arg Ser Ala Leu  
   1                  5                  10                  15  
 Leu Thr Ser Arg Leu Trp Leu Gly Thr Val Asn Phe Ser Gly Arg Val  
           20                  25                  30  
 Glu Asp Asp Asp Ala Leu Arg Leu Met Asp His Ala Arg Asp Arg Gly  
       35                  40                  45

```
<210> 3
<211> 361
<212> PRT
<213>
```

<400> 3

Met	Thr	Thr	Thr	Asp	Arg	Ala	Gly	Leu	Gly	Arg	Gln	Leu	Gln	Met	Ile	
1				5					10					15		
Arg	Gly	Leu	His	Trp	Gly	Tyr	Gly	Ser	Asn	Gly	Asp	Pro	Tyr	Pro	Met	
			20					25					30			
Leu	Leu	Cys	Gly	His	Asp	Asp	Asp	Pro	Gln	Arg	Arg	Tyr	Arg	Ser	Met	
		35					40					45				
Arg	Glu	Ser	Gly	Val	Arg	Arg	Ser	Arg	Thr	Glu	Thr	Trp	Val	Val	Ala	
	50					55					60					
Asp	His	Ala	Thr	Ala	Arg	Gln	Val	Leu	Asp	Asp	Pro	Ala	Phe	Thr	Arg	
65					70				75						80	
Ala	Thr	Gly	Arg	Thr	Pro	Glu	Trp	Met	Arg	Ala	Ala	Gly	Ala	Pro	Pro	
				85					90					95		
Ala	Glu	Trp	Ala	Gln	Pro	Phe	Arg	Asp	Val	His	Ala	Ala	Ser	Trp	Glu	
			100					105					110			
Gly	Glu	Val	Pro	Asp	Val	Gly	Glu	Leu	Ala	Glu	Ser	Phe	Ala	Gly	Leu	
		115					120					125				
Leu	Pro	Gly	Ala	Gly	Ala	Arg	Leu	Asp	Leu	Val	Gly	Asp	Phe	Ala	Trp	
	130					135					140					
Gln	Val	Pro	Val	Gln	Gly	Met	Thr	Ala	Val	Leu	Gly	Ala	Ala	Gly	Val	
145					150					155					160	
Leu	Arg	Gly	Ala	Ala	Trp	Asp	Ala	Arg	Val	Ser	Leu	Asp	Ala	Gln	Leu	
			165						170					175		
Ser	Pro	Gln	Gln	Leu	Ala	Val	Thr	Glu	Ala	Ala	Val	Ala	Ala	Leu	Pro	
			180					185						190		
Ala	Asp	Pro	Ala	Leu	Arg	Ala	Leu	Phe	Ala	Gly	Ala	Glu	Met	Thr	Ala	
		195					200					205				
Asn	Thr	Val	Val	Asp	Ala	Val	Leu	Ala	Val	Ser	Ala	Glu	Pro	Gly	Leu	
	210					215					220					
Ala	Glu	Arg	Ile	Ala	Asp	Asp	Pro	Ala	Ala	Ala	Gln	Arg	Thr	Val	Ala	
225					230					235					240	
Glu	Val	Leu	Arg	Leu	His	Pro	Ala	Leu	His	Leu	Glu	Arg	Arg	Thr	Ala	
				245					250					255		
Thr	Ala	Glu	Val	Arg	Leu	Gly	Glu	His	Val	Ile	Gly	Glu	Gly	Glu	Glu	
			260					265					270			
Val	Val	Val	Val	Val	Ala	Ala	Ala	Asn	Arg	Asp	Pro	Glu	Val	Phe	Ala	
			275				280					285				
Glu	Pro	Asp	Arg	Leu	Asp	Val	Asp	Arg	Pro	Asp	Ala	Asp	Arg	Ala	Leu	
	290					295					300					
Ser	Ala	His	Arg	Gly	His	Pro	Gly	Arg	Leu	Glu	Glu	Leu	Val	Thr	Ala	
305					310					315					320	



gtcctcggtg agcgccgggg acgcgaccac gcggaacctg tgccccgccg cgcggaacgc 1200  
ccatgcgagg gggacgaggc cgaagaggtg gctcttgctg gccatggagg agaagacgac 1260  
gcgcat 1266

<210> 5  
<211> 421  
<212> PRT  
<213>

<400> 5

Met Arg Val Val Phe Ser Ser Met Ala Ser Lys Ser His Leu Phe Gly  
1 5 10 15  
Leu Val Pro Leu Ala Trp Ala Phe Arg Ala Ala Gly His Glu Val Arg  
20 25 30  
Val Val Ala Ser Pro Ala Leu Thr Glu Asp Ile Thr Ala Ala Gly Leu  
35 40 45  
Thr Ala Val Pro Val Gly Thr Asp Val Asp Leu Val Asp Phe Met Thr  
50 55 60  
His Ala Gly His Asp Ile Ile Asp Tyr Val Arg Ser Leu Asp Phe Ser  
65 70 75 80  
Glu Arg Asp Pro Ala Thr Leu Thr Trp Glu His Leu Leu Gly Met Gln  
85 90 95  
Thr Val Leu Thr Pro Thr Phe Tyr Ala Leu Met Ser Pro Asp Thr Leu  
100 105 110  
Ile Glu Gly Met Val Ser Phe Cys Arg Lys Trp Arg Pro Asp Leu Val  
115 120 125  
Ile Trp Glu Pro Leu Thr Phe Ala Ala Pro Ile Ala Ala Ala Val Thr  
130 135 140  
Gly Thr Pro His Ala Arg Leu Leu Trp Gly Pro Asp Ile Thr Thr Arg  
145 150 155 160  
Ala Arg Gln Asn Phe Leu Gly Leu Leu Pro Asp Gln Pro Glu Glu His  
165 170 175  
Arg Glu Asp Pro Leu Ala Glu Trp Leu Thr Trp Thr Leu Glu Lys Tyr  
180 185 190  
Gly Gly Pro Ala Phe Asp Glu Glu Val Val Val Gly Gln Trp Thr Ile  
195 200 205  
Asp Pro Ala Pro Ala Ala Ile Arg Leu Asp Thr Gly Leu Lys Thr Val  
210 215 220  
Gly Met Arg Tyr Val Asp Tyr Asn Gly Pro Ser Val Val Pro Glu Trp  
225 230 235 240  
Leu His Asp Glu Pro Glu Arg Arg Arg Val Cys Leu Thr Leu Gly Ile  
245 250 255

Ser Ser Arg Glu Asn Ser Ile Gly Gln Val Ser Ile Glu Glu Leu Leu  
 260 265 270  
 Gly Ala Val Gly Asp Val Asp Ala Glu Ile Ile Ala Thr Phe Asp Ala  
 275 280 285  
 Gln Gln Leu Glu Gly Val Ala Asn Ile Pro Asp Asn Val Arg Thr Val  
 290 295 300  
 Gly Phe Val Pro Met His Ala Leu Leu Pro Thr Cys Ala Ala Thr Val  
 305 310 315 320  
 His His Gly Gly Pro Gly Ser Trp His Thr Ala Ala Ile His Gly Val  
 325 330 335  
 Pro Gln Val Ile Leu Pro Asp Gly Trp Asp Thr Gly Val Arg Ala Gln  
 340 345 350  
 Arg Thr Gln Glu Phe Gly Ala Gly Ile Ala Leu Pro Val Pro Glu Leu  
 355 360 365  
 Thr Pro Asp Gln Leu Arg Glu Ser Val Lys Arg Val Leu Asp Asp Pro  
 370 375 380  
 Ala His Arg Ala Gly Ala Ala Arg Met Arg Asp Asp Met Leu Ala Glu  
 385 390 395 400  
 Pro Ser Pro Ala Glu Val Val Gly Ile Cys Glu Glu Leu Ala Ala Gly  
 405 410 415  
 Arg Arg Glu Pro Arg  
 420

<210> 6  
 <211> 8160  
 <212> DNA  
 <213> Saccharopolyspora erythraea

<220>  
 <221> CDS  
 <222> (242)..(1207)  
 <223> /function= "involved in the biosynthesis of  
 mycarose" /gene= "eryBIV" /transl\_except= (pos:  
 242 .. 244, aa; Met)

<220>  
 <221> CDS  
 <222> (1210)..(2454)  
 <223> /function= "involved in the biosynthesis of  
 mycarose" /gene= "eryBV" /transl\_except= (pos:  
 1210 .. 1212, aa: Met)

<220>  
 <221> CDS  
 <222> (2510)..(3220)  
 <223> /function= "involved in the biosynthesis of  
 desosamine" /gene= "eryCVI"

<220>

<221> CDS  
 <222> (3308)..(4837)  
 <223> /function= "involved in the biosynthesis of  
 mycarose" /gene= "eryBVI" /transl\_except= (pos:  
 3308...3310, aa: Met)

<220>  
 <221> CDS  
 <222> (6080)..(7546)  
 <223> /function= "involved in the biosynthesis of  
 desosamine" /gene= "eryCV"

<220>  
 <221> CDS  
 <222> (7578)..(8156)  
 <223> /function= "involved in the biosynthesis of  
 mycarose" /gene= "eryBVII" /transl\_except=  
 (pos:7578 .. 7580, aa: Met)

<220>  
 <221> mat\_peptide  
 <222> (242)

<400> 6  
 ttgacaggt cgcacgcg tccccctact cgacgaccac gcaatgggcg aacaatatag 60  
 gaaggatcaa gaggttgaca tcgcctcgtc gagccaacga acctgtgaac atctgcatgt 120  
 tgacaagatc aacggcgggt acctactgtg gtggcccagt gacggggttg cgcacatcgc 180  
 gctggggaga ttctttgaat ttgcgccgta gcaccgacct ggaaagcgag caaatgctcc 240  
 g gtg aat ggg atc agt gat tcc ccg cgt caa ttg atc acc ctt ctg ggc 289  
 Met Asn Gly Ile Ser Asp Ser Pro Arg Gln Leu Ile Thr Leu Leu Gly  
 1 5 10 15  
 gct tcc ggc ttc gtc ggg agc gcg gtt ctg cgc gag ctg cgc gac cac 337  
 Ala Ser Gly Phe Val Gly Ser Ala Val Leu Arg Glu Leu Arg Asp His  
 20 25 30  
 ccg gtc cgg ctg cgc gcg gtg tcc cgc ggc gga gcg ccc gcg gtt ccg 385  
 Pro Val Arg Leu Arg Ala Val Ser Arg Gly Gly Ala Pro Ala Val Pro  
 35 40 45  
 ccc ggc gcc gcg gag gtc gag gac ctg cgc gcc gac ctg ctg gaa ccg 433  
 Pro Gly Ala Ala Glu Val Glu Asp Leu Arg Ala Asp Leu Leu Glu Pro  
 50 55 60  
 ggc cgg gcc gcc gcc gcg atc gag gac gcc gac gtg atc gtg cac ctg 481  
 Gly Arg Ala Ala Ala Ala Ile Glu Asp Ala Asp Val Ile Val His Leu  
 65 70 75 80  
 gtg gcg cac gca gcg ggc ggt tcc acc tgg cgc agc gcc acc tcc gac 529  
 Val Ala His Ala Ala Gly Gly Ser Thr Trp Arg Ser Ala Thr Ser Asp  
 85 90 95  
 ccg gaa gcc gag cgg gtc aac gtc ggc ctg atg cac gac ctc gtc ggc 577  
 Pro Glu Ala Glu Arg Val Asn Val Gly Leu Met His Asp Leu Val Gly  
 100 105 110  
 gcg ctg cac gat cgc cgc agg tcg acg ccg ccc gtg ttg ctc tac gcg 625

Ala	Leu	His	Asp	Arg	Arg	Arg	Ser	Thr	Pro	Pro	Val	Leu	Leu	Tyr	Ala		
		115					120					125					
agc	acc	gca	cag	gcc	gcg	aac	ccg	tcg	gcg	gcc	agc	agg	tac	gcg	cag	673	
Ser	Thr	Ala	Gln	Ala	Ala	Asn	Pro	Ser	Ala	Ala	Ser	Arg	Tyr	Ala	Gln		
	130					135					140						
cag	aag	acc	gag	gcc	gag	cgc	atc	ctg	cgc	aaa	gcc	acc	gac	gag	ggc	721	
Gln	Lys	Thr	Glu	Ala	Glu	Arg	Ile	Leu	Arg	Lys	Ala	Thr	Asp	Glu	Gly		
145					150					155					160		
cgg	gtg	cgc	ggc	gtg	atc	ctg	cgg	ctg	ccc	gcc	gtc	tac	ggc	cag	agc	769	
Arg	Val	Arg	Gly	Val	Ile	Leu	Arg	Leu	Pro	Ala	Val	Tyr	Gly	Gln	Ser		
				165					170					175			
ggc	ccg	tcc	ggc	ccc	atg	ggg	cgg	ggc	gtg	gtc	gca	gcg	atg	atc	cgg	817	
Gly	Pro	Ser	Gly	Pro	Met	Gly	Arg	Gly	Val	Val	Ala	Ala	Met	Ile	Arg		
			180					185					190				
cgt	gcc	ctc	gcc	ggc	gag	ccg	ctc	acc	atg	tgg	cac	gac	ggc	ggc	gtg	865	
Arg	Ala	Leu	Ala	Gly	Glu	Pro	Leu	Thr	Met	Trp	His	Asp	Gly	Gly	Val		
		195					200					205					
cgc	cgc	gac	ctg	ctg	cac	gtc	gag	gac	gtg	gcc	acc	gcg	ttc	gcc	gcc	913	
Arg	Arg	Asp	Leu	Leu	His	Val	Glu	Asp	Val	Ala	Thr	Ala	Phe	Ala	Ala		
	210					215					220						
gcg	ctg	gag	cac	cac	gac	gcg	ctg	gcc	ggc	ggc	acg	tgg	gcg	ctg	ggc	961	
Ala	Leu	Glu	His	His	Asp	Ala	Leu	Ala	Gly	Gly	Thr	Trp	Ala	Leu	Gly		
225					230					235					240		
gcc	gac	cga	tcc	gag	ccg	ctc	ggc	gac	atc	ttc	cgg	gcc	gtc	tcc	ggc	1009	
Ala	Asp	Arg	Ser	Glu	Pro	Leu	Gly	Asp	Ile	Phe	Arg	Ala	Val	Ser	Gly		
				245					250					255			
agc	gtc	gcc	cgg	cag	acc	ggc	agc	ccc	gcc	gtc	gac	gtg	gtc	acc	gtg	1057	
Ser	Val	Ala	Arg	Gln	Thr	Gly	Ser	Pro	Ala	Val	Asp	Val	Val	Thr	Val		
			260					265					270				
ccc	gcg	ccc	gag	cac	gcc	gag	gcc	aac	gac	ttc	cgc	agc	gac	gac	atc	1105	
Pro	Ala	Pro	Glu	His	Ala	Glu	Ala	Asn	Asp	Phe	Arg	Ser	Asp	Asp	Ile		
		275					280					285					
gac	tcc	acc	gag	ttc	cgc	agc	cgg	acc	ggc	tgg	cgc	ccc	cgg	gtt	tcc	1153	
Asp	Ser	Thr	Glu	Phe	Arg	Ser	Arg	Thr	Gly	Trp	Arg	Pro	Arg	Val	Ser		
	290					295					300						
ctc	acc	gac	ggc	atc	gac	cgg	acg	gtg	gcc	gcc	ctg	acc	ccc	acc	gag	1201	
Leu	Thr	Asp	Gly	Ile	Asp	Arg	Thr	Val	Ala	Ala	Leu	Thr	Pro	Thr	Glu		
305					310					315					320		
gag	cac	ta	gtg	cgg	gta	ctg	ctg	acg	tcc	ttc	gcg	cac	cgc	acg	cac	1248	
Glu	His		Met	Arg	Val	Leu	Leu	Thr	Ser	Phe	Ala	His	Arg	Thr	His		
					325					330					335		
ttc	cag	gga	ctg	gtc	ccg	ctg	gcg	tgg	gcg	ctg	cgc	acc	gcg	ggc	cac	1296	
Phe	Gln	Gly	Leu	Val	Pro	Leu	Ala	Trp	Ala	Leu	Arg	Thr	Ala	Gly	His		
				340					345					350			
gac	gtg	cgc	gtg	gcc	gcc	cag	ccc	gcg	ctc	acc	gac	gcg	gtc	atc	ggc	1344	

Asp	Val	Arg	Val	Ala	Ala	Gln	Pro	Ala	Leu	Thr	Asp	Ala	Val	Ile	Gly		
			355					360					365				
gcc	ggt	ctc	acc	gcg	gta	ccc	gtc	ggc	tcc	gac	cac	cgg	ctg	ttc	gac	1392	
Ala	Gly	Leu	Thr	Ala	Val	Pro	Val	Gly	Ser	Asp	His	Arg	Leu	Phe	Asp		
		370					375					380					
atc	gtc	ccg	gaa	gtc	gcc	gct	cag	gtg	cac	cgc	tac	tcc	ttc	tac	ctg	1440	
Ile	Val	Pro	Glu	Val	Ala	Ala	Gln	Val	His	Arg	Tyr	Ser	Phe	Tyr	Leu		
	385						390				395						
gac	ttc	tac	cac	cgc	gag	cag	gag	ctg	cac	tcg	tgg	gag	ttc	ctg	ctc	1488	
Asp	Phe	Tyr	His	Arg	Glu	Gln	Glu	Leu	His	Ser	Trp	Glu	Phe	Leu	Leu		
400					405					410					415		
ggc	atg	cag	gag	gcc	acc	tcg	cgg	tgg	gta	tac	ccg	gtg	gtc	aac	aac	1536	
Gly	Met	Gln	Glu	Ala	Thr	Ser	Arg	Trp	Val	Tyr	Pro	Val	Val	Asn	Asn		
				420				425						430			
gac	tcc	ttc	gtc	gcc	gag	ctg	gtc	gac	ttc	gcc	cgg	gac	tgg	cgt	cct	1584	
Asp	Ser	Phe	Val	Ala	Glu	Leu	Val	Asp	Phe	Ala	Arg	Asp	Trp	Arg	Pro		
			435					440					445				
gac	ctg	gtg	ctc	tgg	gag	ccg	ttc	acc	ttc	gcc	ggc	gcc	gtc	gcg	gcc	1632	
Asp	Leu	Val	Leu	Trp	Glu	Pro	Phe	Thr	Phe	Ala	Gly	Ala	Val	Ala	Ala		
		450					455					460					
cgg	gcc	tgc	gga	gcc	gcg	cac	gcc	cgg	ctg	ctg	tgg	ggc	agc	gac	ctc	1680	
Arg	Ala	Cys	Gly	Ala	Ala	His	Ala	Arg	Leu	Leu	Trp	Gly	Ser	Asp	Leu		
	465					470					475						
acc	ggc	tac	ttc	cgc	ggc	cgg	ttc	cag	gcg	caa	cgc	ctg	cga	cgg	ccg	1728	
Thr	Gly	Tyr	Phe	Arg	Gly	Arg	Phe	Gln	Ala	Gln	Arg	Leu	Arg	Arg	Pro		
480					485					490					495		
ccg	gag	gac	cgg	ccg	gac	ccg	ctg	ggc	acg	tgg	ctg	acc	gag	gtc	gcg	1776	
Pro	Glu	Asp	Arg	Pro	Asp	Pro	Leu	Gly	Thr	Trp	Leu	Thr	Glu	Val	Ala		
				500					505					510			
ggg	cgc	ttc	ggc	gtc	gaa	ttc	ggc	gag	gac	ctc	gcg	gtc	ggg	cag	tgg	1824	
Gly	Arg	Phe	Gly	Val	Glu	Phe	Gly	Glu	Asp	Leu	Ala	Val	Gly	Gln	Trp		
			515					520					525				
tcg	gtc	gac	cag	ttg	ccg	ccg	agt	ttc	cgg	ctg	gac	acc	gga	atg	gaa	1872	
Ser	Val	Asp	Gln	Leu	Pro	Pro	Ser	Phe	Arg	Leu	Asp	Thr	Gly	Met	Glu		
		530					535					540					
acc	gtt	gtc	gcg	cgg	acc	ctg	ccc	tac	aac	ggc	gcg	tcg	gtg	gtt	ccg	1920	
Thr	Val	Val	Ala	Arg	Thr	Leu	Pro	Tyr	Asn	Gly	Ala	Ser	Val	Val	Pro		
	545					550					555						
gac	tgg	ctc	aag	aag	ggc	agt	gcg	act	cga	cgc	atc	tgc	att	acc	gga	1968	
Asp	Trp	Leu	Lys	Lys	Gly	Ser	Ala	Thr	Arg	Arg	Ile	Cys	Ile	Thr	Gly		
560					565					570					575		
ggg	ttc	tcc	gga	ctc	ggg	ctc	gcc	gcc	gat	gcc	gat	cag	ttc	gcg	cgg	2016	
Gly	Phe	Ser	Gly	Leu	Gly	Leu	Ala	Ala	Asp	Ala	Asp	Gln	Phe	Ala	Arg		
				580					585					590			
acg	ctc	gcg	cag	ctc	gcg	cga	ttc	gat	ggc	gaa	atc	gtg	gtt	acg	ggt	2064	
Thr	Leu	Ala	Gln	Leu	Ala	Arg	Phe	Asp	Gly	Glu	Ile	Val	Val	Thr	Gly		

595					600					605					
tcc ggt ccg gat acc tcc gcg gta ccg gac aac att cgt ttg gtg gat	2112														
Ser Gly Pro Asp Thr Ser Ala Val Pro Asp Asn Ile Arg Leu Val Asp															
610 615 620															
ttc gtt ccg atg ggc gtt ctg ctc cag aac tgc gcg gcg atc atc cac	2160														
Phe Val Pro Met Gly Val Leu Leu Gln Asn Cys Ala Ala Ile Ile His															
625 630 635															
cac ggc ggg gcc gga acc tgg gcc acg gca ctg cac cac gga att ccg	2208														
His Gly Gly Ala Gly Thr Trp Ala Thr Ala Leu His His Gly Ile Pro															
640 645 650 655															
caa ata tca gtt gca cat gaa tgg gat tgc atg cta cgc ggc cag cag	2256														
Gln Ile Ser Val Ala His Glu Trp Asp Cys Met Leu Arg Gly Gln Gln															
660 665 670															
acc gcg gaa ctg ggc gcg gga atc tac ctc cgg ccg gac gag gtc gat	2304														
Thr Ala Glu Leu Gly Ala Gly Ile Tyr Leu Arg Pro Asp Glu Val Asp															
675 680 685															
gcc gac tca ttg gcg agc gcc ctc acc cag gtg gtc gag gac ccc acc	2352														
Ala Asp Ser Leu Ala Ser Ala Leu Thr Gln Val Val Glu Asp Pro Thr															
690 695 700															
tac acc gag aac gcg gtg aag ctt cgc gag gag gcg ctg tcc gac ccg	2400														
Tyr Thr Glu Asn Ala Val Lys Leu Arg Glu Glu Ala Leu Ser Asp Pro															
705 710 715															
acg ccg cag gag atc gtc ccg cga ctg gag gaa ctc acg cgc cgc cac	2448														
Thr Pro Gln Glu Ile Val Pro Arg Leu Glu Glu Leu Thr Arg Arg His															
720 725 730 735															
gcc ggc tagcgggtttc cgaccgacaa gtccgtccga cagcacacct ccggagggag	2504														
Ala Gly															
caggg atg tac gag ggc ggg ttc gcc gag ctt tac gac cgg ttc tac cgc	2554														
Met Tyr Glu Gly Gly Phe Ala Glu Leu Tyr Asp Arg Phe Tyr Arg															
740 745 750															
ggc ccg ggc aag gac tac gcg gcc gag gcc gcg cag gtc gcg ccg ctg	2602														
Gly Arg Gly Lys Asp Tyr Ala Ala Glu Ala Ala Gln Val Ala Arg Leu															
755 760 765															
gtc aga gac cgc ctg ccc tcg gct tcc tcg ctg ctc gac gtg gcc tgc	2650														
Val Arg Asp Arg Leu Pro Ser Ala Ser Ser Leu Leu Asp Val Ala Cys															
770 775 780															
ggg acc ggc acc cac ctg cgc ccg ttc gcc gac ctc ttc gac gac gtg	2698														
Gly Thr Gly Thr His Leu Arg Arg Phe Ala Asp Leu Phe Asp Asp Val															
785 790 795 800															
acc ggg ctg gag ctg tcg gcg gcg atg atc gag gtc gcc ccg ccg cag	2746														
Thr Gly Leu Glu Leu Ser Ala Ala Met Ile Glu Val Ala Arg Pro Gln															
805 810 815															
ctc ggc ggc atc ccg gtg ctg cag ggc gac atg cgc gac ttc gcg ctg	2794														
Leu Gly Gly Ile Pro Val Leu Gln Gly Asp Met Arg Asp Phe Ala Leu															
820 825 830															

gat cgc gag ttc gac gcc gtc acc tgc atg ttc agc tcc atc ggg cac	2842
Asp Arg Glu Phe Asp Ala Val Thr Cys Met Phe Ser Ser Ile Gly His	
835 840 845	
atg cgc gac ggc gcc gag ctg gac cag gcg ctg gcg tcc ttc gcc cgc	2890
Met Arg Asp Gly Ala Glu Leu Asp Gln Ala Leu Ala Ser Phe Ala Arg	
850 855 860	
cac ctc gcc ccc ggc ggc gtc gtg gtg gtc gaa ccg tgg tgg ttc ccg	2938
His Leu Ala Pro Gly Gly Val Val Val Val Glu Pro Trp Trp Phe Pro	
865 870 875 880	
gag gac ttc ctc gac ggc tac gtg gcc ggt gac gtg gtg cgc gac ggc	2986
Glu Asp Phe Leu Asp Gly Tyr Val Ala Gly Asp Val Val Arg Asp Gly	
885 890 895	
gac ctg acg atc tcg cgc gtc tcg cac tcc gtg cgc gcc ggc ggc gcg	3034
Asp Leu Thr Ile Ser Arg Val Ser His Ser Val Arg Ala Gly Gly Ala	
900 905 910	
acc cgg atg gag atc cac tgg gtc gtg gcc gac gcg gtg aac ggt ccg	3082
Thr Arg Met Glu Ile His Trp Val Val Ala Asp Ala Val Asn Gly Pro	
915 920 925	
cgg cac cac gtg gag cac tac gag atc acg ctc ttc gag cgg cag cag	3130
Arg His His Val Glu His Tyr Glu Ile Thr Leu Phe Glu Arg Gln Gln	
930 935 940	
tac gag aag gcc ttc acc gcg gcc ggt tgc gct gtg cag tac ctg gag	3178
Tyr Glu Lys Ala Phe Thr Ala Ala Gly Cys Ala Val Gln Tyr Leu Glu	
945 950 955 960	
ggc gga ccc tcc gga cgc ggg ttg ttc gtc ggt gtg cgc gga	3220
Gly Gly Pro Ser Gly Arg Gly Leu Phe Val Gly Val Arg Gly	
965 970	
tgaccctgac gttcgcgttt tccgttcctg gcacaggtga tccgctccac gggccctttc	3280
cccgccgtga ccggaccctt acagtga gtg cgg gtc ttg atc gac aac gcc cgg	3334
Met Arg Val Leu Ile Asp Asn Ala Arg	
975 980	
cgg cag caa gcg gag cgg tcg acg aca ccg cag gga gag tcg atg ggt	3382
Arg Gln Gln Ala Glu Pro Ser Thr Thr Pro Gln Gly Glu Ser Met Gly	
985 990 995	
gat cgg acc ggc gac cgg acg att ccg gaa tcc tcg cag acc gca acg	3430
Asp Arg Thr Gly Asp Arg Thr Ile Pro Glu Ser Ser Gln Thr Ala Thr	
1000 1005 1010 1015	
cgt ttc ctg ctc ggc gac ggc gga atc ccc acc gcc acg gcg gaa acc	3478
Arg Phe Leu Leu Gly Asp Gly Gly Ile Pro Thr Ala Thr Ala Glu Thr	
1020 1025 1030	
cac gac tgg ctg acc cgc aac ggc gcc gag cag cgg ctc gag gtg gcg	3526
His Asp Trp Leu Thr Arg Asn Gly Ala Glu Gln Arg Leu Glu Val Ala	
1035 1040 1045	
cgc gtg ccg ttc agc gcc atg gac cgc tgg tcg ttc cag ccc gag gac	3574
Arg Val Pro Phe Ser Ala Met Asp Arg Trp Ser Phe Gln Pro Glu Asp	
1050 1055 1060	

ggc agg ctc gcc cac gag tcc ggg cgc ttc ttc tcc atc gag ggc ctg Gly Arg Leu Ala His Glu Ser Gly Arg Phe Phe Ser Ile Glu Gly Leu 1065 1070 1075	3622
cac gtg cgg acg aac ttc ggc tgg cgg cgg gac tgg atc cag ccc atc His Val Arg Thr Asn Phe Gly Trp Arg Arg Asp Trp Ile Gln Pro Ile 1080 1085 1090 1095	3670
atc gtg cag ccc gag atc ggc ttc ctc ggc ctc atc gtc aag gag ttc Ile Val Gln Pro Glu Ile Gly Phe Leu Gly Leu Ile Val Lys Glu Phe 1100 1105 1110	3718
gac ggt gtg ctg cac gtg ctg gcg cag gcc aag gcc gag ccg ggc aac Asp Gly Val Leu His Val Leu Ala Gln Ala Lys Ala Glu Pro Gly Asn 1115 1120 1125	3766
atc aac gcc gtc cag ctc tcc ccg acc ctg cag gcg acc cgc agc aac Ile Asn Ala Val Gln Leu Ser Pro Thr Leu Gln Ala Thr Arg Ser Asn 1130 1135 1140	3814
tac acc ggc gtc cac cgc ggc tcg aag gtc cgg ttc atc gag tac ttc Tyr Thr Gly Val His Arg Gly Ser Lys Val Arg Phe Ile Glu Tyr Phe 1145 1150 1155	3862
aac ggc acg cgc ccg agc cgg atc ctc gtc gac gtg ctc cag tcc gag Asn Gly Thr Arg Pro Ser Arg Ile Leu Val Asp Val Leu Gln Ser Glu 1160 1165 1170 1175	3910
cag ggc gcg tgg ttc ctg cgc aag cgc aac cgg aac atg gtc gtc gag Gln Gly Ala Trp Phe Leu Arg Lys Arg Asn Arg Asn Met Val Val Glu 1180 1185 1190	3958
gtg ttc gac gac ctg ccc gag cac ccg aac ttc cgg tgg ctg acc gtc Val Phe Asp Asn Leu Pro Glu His Pro Asn Phe Arg Trp Leu Thr Val 1195 1200 1205	4006
gcg cag ctg cgg gcg atg ctg cac cac gac aac gtg gtg aac atg gac Ala Gln Leu Arg Ala Met Leu His His Asp Asn Val Val Asn Met Asp 1210 1215 1220	4054
ctg cgc acc gtg ctg gcc tgc gtc ccg acc gcc gtg gag cgg gac cgg Leu Arg Thr Val Leu Ala Cys Val Pro Thr Ala Val Glu Arg Asp Arg 1225 1230 1235	4102
gcc gac gac gtg ctc gcg cgc ctg ccc gag ggc tcg ttc cag gcc cgg Ala Asp Asp Val Leu Ala Arg Leu Pro Glu Gly Ser Phe Gln Ala Arg 1240 1245 1250 1255	4150
ctg ctg cac tcg ttc atc ggc gcg ggc acc ccg gcc aac aac atg aac Leu Leu His Ser Phe Ile Gly Ala Gly Thr Pro Ala Asn Asn Met Asn 1260 1265 1270	4198
agc ctg ctg agc tgg atc tcc gac gtg cgc gcc agg cgc gag ttc gtg Ser Leu Leu Ser Trp Ile Ser Asp Val Arg Ala Arg Arg Glu Phe Val 1275 1280 1285	4246
cag cgc ggc cgc ccg ctg ccc gac atc gag cgc agc ggg tgg atc cgc Gln Arg Gly Arg Pro Leu Pro Asp Ile Glu Arg Ser Gly Trp Ile Arg 1290 1295 1300	4294

cgc gac gac ggc atc gag cac gag gag aag aag tac ttc gac gtc ttc	4342
Arg Asp Asp Gly Ile Glu His Glu Glu Lys Lys Tyr Phe Asp Val Phe	
1305 1310 1315	
ggc gtc acg gtg gcg acc agc gac cgc gag gtc aac tcg tgg atg cag	4390
Gly Val Thr Val Ala Thr Ser Asp Arg Glu Val Asn Ser Trp Met Gln	
1320 1325 1330 1335	
ccg ctg ctc tcg ccc gcc aac aac ggc ctg ctc gcc ctg ctg gtc aag	4438
Pro Leu Leu Ser Pro Ala Asn Asn Gly Leu Leu Ala Leu Leu Val Lys	
1340 1345 1350	
gac atc ggc ggc acg ttg cac gcg ctc gtg cag ctg cgc acc gag gcg	4486
Asp Ile Gly Gly Thr Leu His Ala Leu Val Gln Leu Arg Thr Glu Ala	
1355 1360 1365	
ggc ggg atg gac gtc gcc gag ctg gcg cct acg gtg cac tgc cag ccc	4534
Gly Gly Met Asp Val Ala Glu Leu Ala Pro Thr Val His Cys Gln Pro	
1370 1375 1380	
gac aac tac gcc gac gcg ccc gag gag ttc cga ccg gcc tat gtg gac	4582
Asp Asn Tyr Ala Asp Ala Pro Glu Glu Phe Arg Pro Ala Tyr Val Asp	
1385 1390 1395	
tac gtg ttg aac gtg ccg cgc tcg cag gtc cgc tac gac gca tgg cac	4630
Tyr Val Leu Asn Val Pro Arg Ser Gln Val Arg Tyr Asp Ala Trp His	
1400 1405 1410 1415	
tcc gag gag ggc ggc cgg ttc tac cgc aac gag aac cgg tac atg ctg	4678
Ser Glu Glu Gly Gly Arg Phe Tyr Arg Asn Glu Asn Arg Tyr Met Leu	
1420 1425 1430	
atc gag gtg ccc gcc gac ttc gac gcc agt gcc gct ccc gac cac cgg	4726
Ile Glu Val Pro Ala Asp Phe Asp Ala Ser Ala Ala Pro Asp His Arg	
1435 1440 1445	
tgg atg acc ttc gac cag atc acc tac ctg ctc ggg cac agc cac tac	4774
Trp Met Thr Phe Asp Gln Ile Thr Tyr Leu Leu Gly His Ser His Tyr	
1450 1455 1460	
gtc aac atc cag ctg cgc agc atc atc gcg tgc gcc tcg gcc gtc tac	4822
Val Asn Ile Gln Leu Arg Ser Ile Ile Ala Cys Ala Ser Ala Val Tyr	
1465 1470 1475	
acc agg acc gcc gga tgaaacgcgc gctgaccgac ctggcgatct tcggcgggccc	4877
Thr Arg Thr Ala Gly	
1480	
cgaggcattc ctgcacaccc tctacgtggg caggccgacc gtcgggggacc gggagcggtt	4937
cttcgccccgc ctggagtggg cgctgaacaa caactggctg accaacggcg gaccactggt	4997
gcgcgagttc gagggccggg tcgccgacct ggcgggtgtc cgccactgcg tggccacctg	5057
caacgcgacg gtcgcgctgc aactggtgct gcgcgcgagc gacgtgtccg gcgaggtcgt	5117
catgccttcg atgacgttcg cggccaccgc gcacgcggcg agctggetgg ggctggaacc	5177
ggtgttctgc gacgtggacc ccgagaccgg cctgctcgac cccgagcacg tcgcgtcgct	5237
ggtgacaccg cggacggggc cgatcatcgg cgtgcacctg tggggcaggc ccgctccggt	5297

cgaggcgctg gagaagatcg ccgccgagca ccagggtcaaa ctcttcttcg acgccgcgca 5357  
 cgcgctgggc tgcaccgccg gcggggcgcc ggtcggcgcc ttcggcaacg ccgaggtgtt 5417  
 cagcttccac gccacgaagg cggtcacctc gttcgagggc ggcgccatcg tcaccgacga 5477  
 cgggctgctg gccgaccgca tccgcgccat gcacaacttc gggatcgac cggacaagct 5537  
 ggtgaccgat gtcggcacca acggcaagat gagcgagtgc gccgcggcga tgggcctcac 5597  
 ctcgctcgac gccttcgccg agaccagggg gcacaaccgc ctcaaccacg cgctctactc 5657  
 cgacgagctc cgcgacgtgc gcggcatatc cgtgcacgcg ttcgatcctg gcgagcagaa 5717  
 caactaccag tacgtgatca tctcgggtgga ctccgcggcc accggcatcg accgcgacca 5777  
 gttgcaggcg atcctgcgag cggagaaggt tgtggcacia ccctacttct cccccgggtg 5837  
 ccaccagatg cagccgtacc ggaccgagcc gccgctgcgg ctggagaaca ccgaacagct 5897  
 ctccgaccgg gtgctcgcgc tgcccaccgg ccccgcggtg tccagcgagg acatccggcg 5957  
 ggtgtgcgac atcatccggc tcgccgccac cagcggcgag ctgatcaacg cgcaatggga 6017  
 ccagaggacg cgcaacgggt cgtgacgacc tgcgccacaa gtgccaggag gtctgctccc 6077  
 cg atg aac aca act cgt acg gca acc gcc cag gaa gcg ggg gtc gcc 6124  
 Met Asn Thr Thr Arg Thr Ala Thr Ala Gln Glu Ala Gly Val Ala  
 1485 1490 1495  
 gac gcg gcg cgc ccg gac gtc gac cgg cgg gcg gtc gtg cgg gcg ctg 6172  
 Asp Ala Ala Arg Pro Asp Val Asp Arg Arg Ala Val Val Arg Ala Leu  
 1500 1505 1510 1515  
 agc tcg gag gtc tcc cgc gtc acc ggc gcc ggt gac ggt gac gcc gac 6220  
 Ser Ser Glu Val Ser Arg Val Thr Gly Ala Gly Asp Gly Asp Ala Asp  
 1520 1525 1530  
 gtg cag gcc gcc cgg ctc gcc gac ctc gcc gcg cac tac ggg gcg cac 6268  
 Val Gln Ala Ala Arg Leu Ala Asp Leu Ala Ala His Tyr Gly Ala His  
 1535 1540 1545  
 ccg ttc acg ccg ctg gag cag acg cgt gcg cgg ctc ggc ctg gac cgc 6316  
 Pro Phe Thr Pro Leu Glu Gln Thr Arg Ala Arg Leu Gly Leu Asp Arg  
 1550 1555 1560  
 gcg gag ttc gcc cac ctg ctc gac ctg ttc ggc cgc atc ccg gac ctg 6364  
 Ala Glu Phe Ala His Leu Leu Asp Leu Phe Gly Arg Ile Pro Asp Leu  
 1565 1570 1575  
 ggc acc gcg gtg gag cac ggt ccg gcg ggc aag tac tgg tcc aac acg 6412  
 Gly Thr Ala Val Glu His Gly Pro Ala Gly Lys Tyr Trp Ser Asn Thr  
 1580 1585 1590 1595  
 atc aag ccg ctg gac gcc gca ggc gca ctg gac gcg gcg gtc tac cgc 6460  
 Ile Lys Pro Leu Asp Ala Ala Gly Ala Leu Asp Ala Ala Val Tyr Arg  
 1600 1605 1610  
 aag cct gcc ttc ccc tac agc gtc ggc ctg tac ccc ggg ccg acg tgc 6508  
 Lys Pro Ala Phe Pro Tyr Ser Val Gly Leu Tyr Pro Gly Pro Thr Cys

1615	1620	1625	
atg ttc cgc tgc cac ttc tgc gtg cgg gtg acc ggt gcc cgc tac gag Met Phe Arg Cys His Phe Cys Val Arg Val Thr Gly Ala Arg Tyr Glu 1630 1635 1640			6556
gcc gca tcg gtc ccg gcg ggc aac gag acg ctg gcc gcg atc atc gac Ala Ala Ser Val Pro Ala Gly Asn Glu Thr Leu Ala Ala Ile Ile Asp 1645 1650 1655			6604
gag gtg ccc acg gac aac ccg aag gcg atg tac atg tcg ggc ggg ctc Glu Val Pro Thr Asp Asn Pro Lys Ala Met Tyr Met Ser Gly Gly Leu 1660 1665 1670 1675			6652
gag ccg ctg acc aac ccc ggt ctc ggc gag ctg gtg tcg cac gcc gcc Glu Pro Leu Thr Asn Pro Gly Leu Gly Glu Leu Val Ser His Ala Ala 1680 1685 1690			6700
ggg cgc ggt ttc gac ctc acc gtc tac acc aac gcc ttc gcc ctc acc Gly Arg Gly Phe Asp Leu Thr Val Tyr Thr Asn Ala Phe Ala Leu Thr 1695 1700 1705			6748
gag cag acg ctg aac cgc cag ccc ggc ctg tgg gag ctg ggc gcg atc Glu Gln Thr Leu Asn Arg Gln Pro Gly Leu Trp Glu Leu Gly Ala Ile 1710 1715 1720			6796
cgc acg tcc ctc tac ggg ctg aac aac gac gag tac gag acg acc acc Arg Thr Ser Leu Tyr Gly Leu Asn Asn Asp Glu Tyr Glu Thr Thr Thr 1725 1730 1735			6844
ggc aag cgc ggc gct ttc gaa cgc gtc aag aag aac ctg cag ggc ttc Gly Lys Arg Gly Ala Phe Glu Arg Val Lys Lys Asn Leu Gln Gly Phe 1740 1745 1750 1755			6892
ctg cgg atg cgc gcc gag cgg gac gcg ccg atc cgg ctc ggc ttc aac Leu Arg Met Arg Ala Glu Arg Asp Ala Pro Ile Arg Leu Gly Phe Asn 1760 1765 1770			6940
cac atc atc ctg ccg gga cgg gcc gac cgg ctc acc gac ctc gtc gac His Ile Ile Leu Pro Gly Arg Ala Asp Arg Leu Thr Asp Leu Val Asp 1775 1780 1785			6988
ttc atc gcc gag ctc aac gag tcc agc ccg caa cgg ccg ctg gac ttc Phe Ile Ala Glu Leu Asn Glu Ser Ser Pro Gln Arg Pro Leu Asp Phe 1790 1795 1800			7036
gtg acg gtg cgc gag gac tac agc ggc cgc gac gac ggc cgg ctg tcg Val Thr Val Arg Glu Asp Tyr Ser Gly Arg Asp Asp Gly Arg Leu Ser 1805 1810 1815			7084
gac tcc gag cgc aac gag ctg cgc gag ggc ctg gtg cgg ttc gtc gac Asp Ser Glu Arg Asn Glu Leu Arg Glu Gly Leu Val Arg Phe Val Asp 1820 1825 1830 1835			7132
tac gcc gcc gag cgg acc ccg ggc atg cac atc gac ctg ggc tac gcc Tyr Ala Ala Glu Arg Thr Pro Gly Met His Ile Asp Leu Gly Tyr Ala 1840 1845 1850			7180
ctg gag agc ctg cgg cgg ggt gtg gac gcc gag ctg ctg cgc atc cgg Leu Glu Ser Leu Arg Arg Gly Val Asp Ala Glu Leu Leu Arg Ile Arg 1855 1860 1865			7228

ccg gag acg atg cgt ccc acc gcg cac ccc cag gtc gcg gtg cag atc Pro Glu Thr Met Arg Pro Thr Ala His Pro Gln Val Ala Val Gln Ile 1870 1875 1880	7276
gac ctg ctc ggc gac gtc tac ctc tac cgc gag gcg ggc ttc ccg gag Asp Leu Leu Gly Asp Val Tyr Leu Tyr Arg Glu Ala Gly Phe Pro Glu 1885 1890 1895	7324
ctg gag ggc gcc acc cgc tac atc gcg ggc cgg gtc acc ccg tcg acc Leu Glu Gly Ala Thr Arg Tyr Ile Ala Gly Arg Val Thr Pro Ser Thr 1900 1905 1910 1915	7372
agc ctg cgc gag gtg gtg gag aac ttc gtg ctg gag aac gag ggc gtg Ser Leu Arg Glu Val Val Glu Asn Phe Val Leu Glu Asn Glu Gly Val 1920 1925 1930	7420
cag ccc cgc ccc ggc gac gag tac ttc ctc gac ggc ttc gac cag tcg Gln Pro Arg Pro Gly Asp Glu Tyr Phe Leu Asp Gly Phe Asp Gln Ser 1935 1940 1945	7468
gtg acc gca cgg ctc aac cag ctc gaa cga gac atc gcc gac ggg tgg Val Thr Ala Arg Leu Asn Gln Leu Glu Arg Asp Ile Ala Asp Gly Trp 1950 1955 1960	7516
gag gac cac cgc ggc ttc ctg cgc gga agg tgaaccggag ttgcgagtac Glu Asp His Arg Gly Phe Leu Arg Gly Arg 1965 1970	7566
gtgagctggc g gtg gcg ggc ggt ttc gag ttc acc ccc gac ccg aag cag Met Ala Gly Gly Phe Glu Phe Thr Pro Asp Pro Lys Gln 1975 1980 1985	7616
gac cgg cgg ggc ctg ttc gtg tct ccg ctg cag gac gag gcg ttc gtg Asp Arg Arg Gly Leu Phe Val Ser Pro Leu Gln Asp Glu Ala Phe Val 1990 1995 2000	7664
ggc gcg gtg ggc cat cgg ttc ccc gtc gcc cag atg aac cac atc gtc Gly Ala Val Gly His Arg Phe Pro Val Ala Gln Met Asn His Ile Val 2005 2010 2015	7712
tcc gcc cgg ggc gtg ctg cgc ggg ctg cac ttc acc acc acc ccg ccg Ser Ala Arg Gly Val Leu Arg Gly Leu His Phe Thr Thr Thr Pro Pro 2020 2025 2030	7760
ggg cag tgc aag tac gtc tac tgc gcg cgc ggc cgg gcg ctc gac gtc Gly Gln Cys Lys Tyr Val Tyr Cys Ala Arg Gly Arg Ala Leu Asp Val 2035 2040 2045 2050	7808
atc gtc gac atc cgg gtc ggc tcg ccg acg ttc ggg aag tgg gac gcg Ile Val Asp Ile Arg Val Gly Ser Pro Thr Phe Gly Lys Trp Asp Ala 2055 2060 2065	7856
gtg gag atg gac acc gag cac ttc cgg gcg gtc tac ttc ccc agg ggc Val Glu Met Asp Thr Glu His Phe Arg Ala Val Tyr Phe Pro Arg Gly 2070 2075 2080	7904
acc gcg cac gcc ttc ctc gcg ctt gag gac gac acc ctg atg tcg tac Thr Ala His Ala Phe Leu Ala Leu Glu Asp Asp Thr Leu Met Ser Tyr 2085 2090 2095	7952

ctg gtc agc acg ccg tac gtg gcc gag tac gag cag gcg atc gac ccg	8000
Leu Val Ser Thr Pro Tyr Val Ala Glu Tyr Glu Gln Ala Ile Asp Pro	
2100 2105 2110	
ttc gac ccc gcg ctg ggt ctg ccg tgg ccc gcg gac ctg gag gtc gtg	8048
Phe Asp Pro Ala Leu Gly Leu Pro Trp Pro Ala Asp Leu Glu Val Val	
2115 2120 2125 2130	
ctc tcc gac cgc gac acg gtg gcc gtg gac ctg gag acc gcc agg cgg	8096
Leu Ser Asp Arg Asp Thr Val Ala Val Asp Leu Glu Thr Ala Arg Arg	
2135 2140 2145	
cga ggg atg ctg ccc gac tac gcc gac tgc ctc ggc gag gag ccc gcc	8144
Arg Gly Met Leu Pro Asp Tyr Ala Asp Cys Leu Gly Glu Glu Pro Ala	
2150 2155 2160	
agc acc ggc agg tgac	8160
Ser Thr Gly Arg	
2165	

<210> 7  
 <211> 322  
 <212> PRT  
 <213>

<400> 7  
 Met Asn Gly Ile Ser Asp Ser Pro Arg Gln Leu Ile Thr Leu Leu Gly  
 1 5 10 15  
 Ala Ser Gly Phe Val Gly Ser Ala Val Leu Arg Glu Leu Arg Asp His  
 20 25 30  
 Pro Val Arg Leu Arg Ala Val Ser Arg Gly Gly Ala Pro Ala Val Pro  
 35 40 45  
 Pro Gly Ala Ala Glu Val Glu Asp Leu Arg Ala Asp Leu Leu Glu Pro  
 50 55 60  
 Gly Arg Ala Ala Ala Ala Ile Glu Asp Ala Asp Val Ile Val His Leu  
 65 70 75 80  
 Val Ala His Ala Ala Gly Gly Ser Thr Trp Arg Ser Ala Thr Ser Asp  
 85 90 95  
 Pro Glu Ala Glu Arg Val Asn Val Gly Leu Met His Asp Leu Val Gly  
 100 105 110  
 Ala Leu His Asp Arg Arg Arg Ser Thr Pro Pro Val Leu Leu Tyr Ala  
 115 120 125  
 Ser Thr Ala Gln Ala Ala Asn Pro Ser Ala Ala Ser Arg Tyr Ala Gln  
 130 135 140  
 Gln Lys Thr Glu Ala Glu Arg Ile Leu Arg Lys Ala Thr Asp Glu Gly  
 145 150 155 160  
 Arg Val Arg Gly Val Ile Leu Arg Leu Pro Ala Val Tyr Gly Gln Ser  
 165 170 175

Gly Pro Ser Gly Pro Met Gly Arg Gly Val Val Ala Ala Met Ile Arg  
 180 185 190  
 Arg Ala Leu Ala Gly Glu Pro Leu Thr Met Trp His Asp Gly Gly Val  
 195 200 205  
 Arg Arg Asp Leu Leu His Val Glu Asp Val Ala Thr Ala Phe Ala Ala  
 210 215 220  
 Ala Leu Glu His His Asp Ala Leu Ala Gly Gly Thr Trp Ala Leu Gly  
 225 230 235 240  
 Ala Asp Arg Ser Glu Pro Leu Gly Asp Ile Phe Arg Ala Val Ser Gly  
 245 250 255  
 Ser Val Ala Arg Gln Thr Gly Ser Pro Ala Val Asp Val Val Thr Val  
 260 265 270  
 Pro Ala Pro Glu His Ala Glu Ala Asn Asp Phe Arg Ser Asp Asp Ile  
 275 280 285  
 Asp Ser Thr Glu Phe Arg Ser Arg Thr Gly Trp Arg Pro Arg Val Ser  
 290 295 300  
 Leu Thr Asp Gly Ile Asp Arg Thr Val Ala Ala Leu Thr Pro Thr Glu  
 305 310 315 320

Glu His

<210> 8

<211> 415

<212> PRT .

<213>

<400> 8

Met Arg Val Leu Leu Thr Ser Phe Ala His Arg Thr His Phe Gln Gly  
 1 5 10 15  
 Leu Val Pro Leu Ala Trp Ala Leu Arg Thr Ala Gly His Asp Val Arg  
 20 25 30  
 Val Ala Ala Gln Pro Ala Leu Thr Asp Ala Val Ile Gly Ala Gly Leu  
 35 40 45  
 Thr Ala Val Pro Val Gly Ser Asp His Arg Leu Phe Asp Ile Val Pro  
 50 55 60  
 Glu Val Ala Ala Gln Val His Arg Tyr Ser Phe Tyr Leu Asp Phe Tyr  
 65 70 75 80  
 His Arg Glu Gln Glu Leu His Ser Trp Glu Phe Leu Leu Gly Met Gln  
 85 90 95  
 Glu Ala Thr Ser Arg Trp Val Tyr Pro Val Val Asn Asn Asp Ser Phe  
 100 105 110  
 Val Ala Glu Leu Val Asp Phe Ala Arg Asp Trp Arg Pro Asp Leu Val  
 115 120 125  
 Leu Trp Glu Pro Phe Thr Phe Ala Gly Ala Val Ala Ala Arg Ala Cys  
 130 135 140

Gly Ala Ala His Ala Arg Leu Leu Trp Gly Ser Asp Leu Thr Gly Tyr  
 145 150 155 160  
 Phe Arg Gly Arg Phe Gln Ala Gln Arg Leu Arg Arg Pro Pro Glu Asp  
 165 170 175  
 Arg Pro Asp Pro Leu Gly Thr Trp Leu Thr Glu Val Ala Gly Arg Phe  
 180 185 190  
 Gly Val Glu Phe Gly Glu Asp Leu Ala Val Gly Gln Trp Ser Val Asp  
 195 200 205  
 Gln Leu Pro Pro Ser Phe Arg Leu Asp Thr Gly Met Glu Thr Val Val  
 210 215 220  
 Ala Arg Thr Leu Pro Tyr Asn Gly Ala Ser Val Val Pro Asp Trp Leu  
 225 230 235 240  
 Lys Lys Gly Ser Ala Thr Arg Arg Ile Cys Ile Thr Gly Gly Phe Ser  
 245 250 255  
 Gly Leu Gly Leu Ala Ala Asp Ala Asp Gln Phe Ala Arg Thr Leu Ala  
 260 265 270  
 Gln Leu Ala Arg Phe Asp Gly Glu Ile Val Val Thr Gly Ser Gly Pro  
 275 280 285  
 Asp Thr Ser Ala Val Pro Asp Asn Ile Arg Leu Val Asp Phe Val Pro  
 290 295 300  
 Met Gly Val Leu Leu Gln Asn Cys Ala Ala Ile Ile His His Gly Gly  
 305 310 315 320  
 Ala Gly Thr Trp Ala Thr Ala Leu His His Gly Ile Pro Gln Ile Ser  
 325 330 335  
 Val Ala His Glu Trp Asp Cys Met Leu Arg Gly Gln Gln Thr Ala Glu  
 340 345 350  
 Leu Gly Ala Gly Ile Tyr Leu Arg Pro Asp Glu Val Asp Ala Asp Ser  
 355 360 365  
 Leu Ala Ser Ala Leu Thr Gln Val Val Glu Asp Pro Thr Tyr Thr Glu  
 370 375 380  
 Asn Ala Val Lys Leu Arg Glu Glu Ala Leu Ser Asp Pro Thr Pro Gln  
 385 390 395 400  
 Glu Ile Val Pro Arg Leu Glu Glu Leu Thr Arg Arg His Ala Gly  
 405 410 415

<210> 9  
 <211> 237  
 <212> PRT  
 <213>

<400> 9  
 Met Tyr Glu Gly Gly Phe Ala Glu Leu Tyr Asp Arg Phe Tyr Arg Gly  
 1 5 10 15

Arg Gly Lys Asp Tyr Ala Ala Glu Ala Ala Gln Val Ala Arg Leu Val  
                     20                                    25                                    30  
 Arg Asp Arg Leu Pro Ser Ala Ser Ser Leu Leu Asp Val Ala Cys Gly  
                     35                                    40                                    45  
 Thr Gly Thr His Leu Arg Arg Phe Ala Asp Leu Phe Asp Asp Val Thr  
                     50                                    55                                    60  
 Gly Leu Glu Leu Ser Ala Ala Met Ile Glu Val Ala Arg Pro Gln Leu  
                     65                                    70                                    75                                    80  
 Gly Gly Ile Pro Val Leu Gln Gly Asp Met Arg Asp Phe Ala Leu Asp  
                                     85                                    90                                    95  
 Arg Glu Phe Asp Ala Val Thr Cys Met Phe Ser Ser Ile Gly His Met  
                     100                                    105                                    110  
 Arg Asp Gly Ala Glu Leu Asp Gln Ala Leu Ala Ser Phe Ala Arg His  
                     115                                    120                                    125  
 Leu Ala Pro Gly Gly Val Val Val Val Glu Pro Trp Trp Phe Pro Glu  
                     130                                    135                                    140  
 Asp Phe Leu Asp Gly Tyr Val Ala Gly Asp Val Val Arg Asp Gly Asp  
                     145                                    150                                    155                                    160  
 Leu Thr Ile Ser Arg Val Ser His Ser Val Arg Ala Gly Gly Ala Thr  
                                     165                                    170                                    175  
 Arg Met Glu Ile His Trp Val Val Ala Asp Ala Val Asn Gly Pro Arg  
                     180                                    185                                    190  
 His His Val Glu His Tyr Glu Ile Thr Leu Phe Glu Arg Gln Gln Tyr  
                     195                                    200                                    205  
 Glu Lys Ala Phe Thr Ala Ala Gly Cys Ala Val Gln Tyr Leu Glu Gly  
                     210                                    215                                    220  
 Gly Pro Ser Gly Arg Gly Leu Phe Val Gly Val Arg Gly  
                     225                                    230                                    235

<210> 10  
 <211> 510  
 <212> PRT  
 <213>

<400> 10

Met Arg Val Leu Ile Asp Asn Ala Arg Arg Gln Gln Ala Glu Pro Ser  
                     1                                    5                                    10                                    15  
 Thr Thr Pro Gln Gly Glu Ser Met Gly Asp Arg Thr Gly Asp Arg Thr  
                                     20                                    25                                    30  
 Ile Pro Glu Ser Ser Gln Thr Ala Thr Arg Phe Leu Leu Gly Asp Gly  
                     35                                    40                                    45  
 Gly Ile Pro Thr Ala Thr Ala Glu Thr His Asp Trp Leu Thr Arg Asn  
                     50                                    55                                    60

Gly	Ala	Glu	Gln	Arg	Leu	Glu	Val	Ala	Arg	Val	Pro	Phe	Ser	Ala	Met	65	70	75	80
Asp	Arg	Trp	Ser	Phe	Gln	Pro	Glu	Asp	Gly	Arg	Leu	Ala	His	Glu	Ser	85	90	95	
Gly	Arg	Phe	Phe	Ser	Ile	Glu	Gly	Leu	His	Val	Arg	Thr	Asn	Phe	Gly	100	105	110	
Trp	Arg	Arg	Asp	Trp	Ile	Gln	Pro	Ile	Ile	Val	Gln	Pro	Glu	Ile	Gly	115	120	125	
Phe	Leu	Gly	Leu	Ile	Val	Lys	Glu	Phe	Asp	Gly	Val	Leu	His	Val	Leu	130	135	140	
Ala	Gln	Ala	Lys	Ala	Glu	Pro	Gly	Asn	Ile	Asn	Ala	Val	Gln	Leu	Ser	145	150	155	160
Pro	Thr	Leu	Gln	Ala	Thr	Arg	Ser	Asn	Tyr	Thr	Gly	Val	His	Arg	Gly	165	170	175	
Ser	Lys	Val	Arg	Phe	Ile	Glu	Tyr	Phe	Asn	Gly	Thr	Arg	Pro	Ser	Arg	180	185	190	
Ile	Leu	Val	Asp	Val	Leu	Gln	Ser	Glu	Gln	Gly	Ala	Trp	Phe	Leu	Arg	195	200	205	
Lys	Arg	Asn	Arg	Asn	Met	Val	Val	Glu	Val	Phe	Asp	Asp	Leu	Pro	Glu	210	215	220	
His	Pro	Asn	Phe	Arg	Trp	Leu	Thr	Val	Ala	Gln	Leu	Arg	Ala	Met	Leu	225	230	235	240
His	His	Asp	Asn	Val	Val	Asn	Met	Asp	Leu	Arg	Thr	Val	Leu	Ala	Cys	245	250	255	
Val	Pro	Thr	Ala	Val	Glu	Arg	Asp	Arg	Ala	Asp	Asp	Val	Leu	Ala	Arg	260	265	270	
Leu	Pro	Glu	Gly	Ser	Phe	Gln	Ala	Arg	Leu	Leu	His	Ser	Phe	Ile	Gly	275	280	285	
Ala	Gly	Thr	Pro	Ala	Asn	Asn	Met	Asn	Ser	Leu	Leu	Ser	Trp	Ile	Ser	290	295	300	
Asp	Val	Arg	Ala	Arg	Arg	Glu	Phe	Val	Gln	Arg	Gly	Arg	Pro	Leu	Pro	305	310	315	320
Asp	Ile	Glu	Arg	Ser	Gly	Trp	Ile	Arg	Arg	Asp	Asp	Gly	Ile	Glu	His	325	330	335	
Glu	Glu	Lys	Lys	Tyr	Phe	Asp	Val	Phe	Gly	Val	Thr	Val	Ala	Thr	Ser	340	345	350	
Asp	Arg	Glu	Val	Asn	Ser	Trp	Met	Gln	Pro	Leu	Leu	Ser	Pro	Ala	Asn	355	360	365	
Asn	Gly	Leu	Leu	Ala	Leu	Leu	Val	Lys	Asp	Ile	Gly	Gly	Thr	Leu	His	370	375	380	

Ala Leu Val Gln Leu Arg Thr Glu Ala Gly Gly Met Asp Val Ala Glu  
 385 390 395 400  
 Leu Ala Pro Thr Val His Cys Gln Pro Asp Asn Tyr Ala Asp Ala Pro  
 405 410 415  
 Glu Glu Phe Arg Pro Ala Tyr Val Asp Tyr Val Leu Asn Val Pro Arg  
 420 425 430  
 Ser Gln Val Arg Tyr Asp Ala Trp His Ser Glu Glu Gly Gly Arg Phe  
 435 440 445  
 Tyr Arg Asn Glu Asn Arg Tyr Met Leu Ile Glu Val Pro Ala Asp Phe  
 450 455 460  
 Asp Ala Ser Ala Ala Pro Asp His Arg Trp Met Thr Phe Asp Gln Ile  
 465 470 475 480  
 Thr Tyr Leu Leu Gly His Ser His Tyr Val Asn Ile Gln Leu Arg Ser  
 485 490 495  
 Ile Ile Ala Cys Ala Ser Ala Val Tyr Thr Arg Thr Ala Gly  
 500 505 510  
 <210> 11  
 <211> 489  
 <212> PRT  
 <213>  
 <400> 11  
 Met Asn Thr Thr Arg Thr Ala Thr Ala Gln Glu Ala Gly Val Ala Asp  
 1 5 10 15  
 Ala Ala Arg Pro Asp Val Asp Arg Arg Ala Val Val Arg Ala Leu Ser  
 20 25 30  
 Ser Glu Val Ser Arg Val Thr Gly Ala Gly Asp Gly Asp Ala Asp Val  
 35 40 45  
 Gln Ala Ala Arg Leu Ala Asp Leu Ala Ala His Tyr Gly Ala His Pro  
 50 55 60  
 Phe Thr Pro Leu Glu Gln Thr Arg Ala Arg Leu Gly Leu Asp Arg Ala  
 65 70 75 80  
 Glu Phe Ala His Leu Leu Asp Leu Phe Gly Arg Ile Pro Asp Leu Gly  
 85 90 95  
 Thr Ala Val Glu His Gly Pro Ala Gly Lys Tyr Trp Ser Asn Thr Ile  
 100 105 110  
 Lys Pro Leu Asp Ala Ala Gly Ala Leu Asp Ala Ala Val Tyr Arg Lys  
 115 120 125  
 Pro Ala Phe Pro Tyr Ser Val Gly Leu Tyr Pro Gly Pro Thr Cys Met  
 130 135 140  
 Phe Arg Cys His Phe Cys Val Arg Val Thr Gly Ala Arg Tyr Glu Ala  
 145 150 155 160  
 Ala Ser Val Pro Ala Gly Asn Glu Thr Leu Ala Ala Ile Ile Asp Glu

165										170					175				
Val	Pro	Thr	Asp	Asn	Pro	Lys	Ala	Met	Tyr	Met	Ser	Gly	Gly	Leu	Glu				
			180					185						190					
Pro	Leu	Thr	Asn	Pro	Gly	Leu	Gly	Glu	Leu	Val	Ser	His	Ala	Ala	Gly				
		195					200					205							
Arg	Gly	Phe	Asp	Leu	Thr	Val	Tyr	Thr	Asn	Ala	Phe	Ala	Leu	Thr	Glu				
	210					215					220								
Gln	Thr	Leu	Asn	Arg	Gln	Pro	Gly	Leu	Trp	Glu	Leu	Gly	Ala	Ile	Arg				
225					230					235					240				
Thr	Ser	Leu	Tyr	Gly	Leu	Asn	Asn	Asp	Glu	Tyr	Glu	Thr	Thr	Thr	Gly				
				245					250					255					
Lys	Arg	Gly	Ala	Phe	Glu	Arg	Val	Lys	Lys	Asn	Leu	Gln	Gly	Phe	Leu				
			260					265					270						
Arg	Met	Arg	Ala	Glu	Arg	Asp	Ala	Pro	Ile	Arg	Leu	Gly	Phe	Asn	His				
			275				280					285							
Ile	Ile	Leu	Pro	Gly	Arg	Ala	Asp	Arg	Leu	Thr	Asp	Leu	Val	Asp	Phe				
	290					295					300								
Ile	Ala	Glu	Leu	Asn	Glu	Ser	Ser	Pro	Gln	Arg	Pro	Leu	Asp	Phe	Val				
305					310				315						320				
Thr	Val	Arg	Glu	Asp	Tyr	Ser	Gly	Arg	Asp	Asp	Gly	Arg	Leu	Ser	Asp				
				325					330					335					
Ser	Glu	Arg	Asn	Glu	Leu	Arg	Glu	Gly	Leu	Val	Arg	Phe	Val	Asp	Tyr				
			340					345					350						
Ala	Ala	Glu	Arg	Thr	Pro	Gly	Met	His	Ile	Asp	Leu	Gly	Tyr	Ala	Leu				
		355					360					365							
Glu	Ser	Leu	Arg	Arg	Gly	Val	Asp	Ala	Glu	Leu	Leu	Arg	Ile	Arg	Pro				
	370					375					380								
Glu	Thr	Met	Arg	Pro	Thr	Ala	His	Pro	Gln	Val	Ala	Val	Gln	Ile	Asp				
385					390				395						400				
Leu	Leu	Gly	Asp	Val	Tyr	Leu	Tyr	Arg	Glu	Ala	Gly	Phe	Pro	Glu	Leu				
				405					410				415						
Glu	Gly	Ala	Thr	Arg	Tyr	Ile	Ala	Gly	Arg	Val	Thr	Pro	Ser	Thr	Ser				
			420					425					430						
Leu	Arg	Glu	Val	Val	Glu	Asn	Phe	Val	Leu	Glu	Asn	Glu	Gly	Val	Gln				
		435					440					445							
Pro	Arg	Pro	Gly	Asp	Glu	Tyr	Phe	Leu	Asp	Gly	Phe	Asp	Gln	Ser	Val				
	450					455					460								
Thr	Ala	Arg	Leu	Asn	Gln	Leu	Glu	Arg	Asp	Ile	Ala	Asp	Gly	Trp	Glu				
465					470				475						480				
Asp	His	Arg	Gly	Phe	Leu	Arg	Gly	Arg											
				485															

<210> 12  
 <211> 193  
 <212> PRT  
 <213>

<400> 12  
 Met Ala Gly Gly Phe Glu Phe Thr Pro Asp Pro Lys Gln Asp Arg Arg  
 1 5 10 15  
 Gly Leu Phe Val Ser Pro Leu Gln Asp Glu Ala Phe Val Gly Ala Val  
 20 25 30  
 Gly His Arg Phe Pro Val Ala Gln Met Asn His Ile Val Ser Ala Arg  
 35 40 45  
 Gly Val Leu Arg Gly Leu His Phe Thr Thr Thr Pro Pro Gly Gln Cys  
 50 55 60  
 Lys Tyr Val Tyr Cys Ala Arg Gly Arg Ala Leu Asp Val Ile Val Asp  
 65 70 75 80  
 Ile Arg Val Gly Ser Pro Thr Phe Gly Lys Trp Asp Ala Val Glu Met  
 85 90 95  
 Asp Thr Glu His Phe Arg Ala Val Tyr Phe Pro Arg Gly Thr Ala His  
 100 105 110  
 Ala Phe Leu Ala Leu Glu Asp Asp Thr Leu Met Ser Tyr Leu Val Ser  
 115 120 125  
 Thr Pro Tyr Val Ala Glu Tyr Glu Gln Ala Ile Asp Pro Phe Asp Pro  
 130 135 140  
 Ala Leu Gly Leu Pro Trp Pro Ala Asp Leu Glu Val Val Leu Ser Asp  
 145 150 155 160  
 Arg Asp Thr Val Ala Val Asp Leu Glu Thr Ala Arg Arg Arg Gly Met  
 165 170 175  
 Leu Pro Asp Tyr Ala Asp Cys Leu Gly Glu Glu Pro Ala Ser Thr Gly  
 180 185 190  
 Arg

<210> 13  
 <211> 1206  
 <212> DNA  
 <213> Saccharopolyspora erythraea

<220>  
 <221> CDS  
 <222> (1)..(1203)  
 <223> /function= "involved in the biosynthesis of  
 desosamine" /gene= "eryCIV" /note= "SEQ ID No 6  
 from 4837 to 6039"

<220>  
 <221> mat\_peptide

<222>. (1)

<400> 13

atg	aaa	cgc	gcg	ctg	acc	gac	ctg	gcg	atc	ttc	ggc	ggc	ccc	gag	gca	48
Met	Lys	Arg	Ala	Leu	Thr	Asp	Leu	Ala	Ile	Phe	Gly	Gly	Pro	Glu	Ala	
1				5					10					15		
ttc	ctg	cac	acc	ctc	tac	gtg	ggc	agg	ccg	acc	gtc	ggg	gac	cgg	gag	96
Phe	Leu	His	Thr	Leu	Tyr	Val	Gly	Arg	Pro	Thr	Val	Gly	Asp	Arg	Glu	
			20					25					30			
cgg	ttc	ttc	gcc	cgc	ctg	gag	tgg	gcg	ctg	aac	aac	aac	tgg	ctg	acc	144
Arg	Phe	Phe	Ala	Arg	Leu	Glu	Trp	Ala	Leu	Asn	Asn	Asn	Trp	Leu	Thr	
		35					40					45				
aac	ggc	gga	cca	ctg	gtg	cgc	gag	ttc	gag	ggc	cgg	gtc	gcc	gac	ctg	192
Asn	Gly	Gly	Pro	Leu	Val	Arg	Glu	Phe	Glu	Gly	Arg	Val	Ala	Asp	Leu	
	50					55					60					
gcg	ggt	gtc	cgc	cac	tgc	gtg	gcc	acc	tgc	aac	gcg	acg	gtc	gcg	ctg	240
Ala	Gly	Val	Arg	His	Cys	Val	Ala	Thr	Cys	Asn	Ala	Thr	Val	Ala	Leu	
65					70				75						80	
caa	ctg	gtg	ctg	cgc	gcg	agc	gac	gtg	tcc	ggc	gag	gtc	gtc	atg	cct	288
Gln	Leu	Val	Leu	Arg	Ala	Ser	Asp	Val	Ser	Gly	Glu	Val	Val	Met	Pro	
				85					90					95		
tcg	atg	acg	ttc	gcg	gcc	acc	gcg	cac	gcg	gcg	agc	tgg	ctg	ggg	ctg	336
Ser	Met	Thr	Phe	Ala	Ala	Thr	Ala	His	Ala	Ala	Ser	Trp	Leu	Gly	Leu	
			100					105					110			
gaa	ccg	gtg	ttc	tgc	gac	gtg	gac	ccc	gag	acc	ggc	ctg	ctc	gac	ccc	384
Glu	Pro	Val	Phe	Cys	Asp	Val	Asp	Pro	Glu	Thr	Gly	Leu	Leu	Asp	Pro	
		115					120					125				
gag	cac	gtc	gcg	tcg	ctg	gtg	aca	ccg	cgg	acg	ggc	gcg	atc	atc	ggc	432
Glu	His	Val	Ala	Ser	Leu	Val	Thr	Pro	Arg	Thr	Gly	Ala	Ile	Ile	Gly	
	130					135					140					
gtg	cac	ctg	tgg	ggc	agg	ccc	gct	ccg	gtc	gag	gcg	ctg	gag	aag	atc	480
Val	His	Leu	Trp	Gly	Arg	Pro	Ala	Pro	Val	Glu	Ala	Leu	Glu	Lys	Ile	
145					150					155					160	
gcc	gcc	gag	cac	cag	gtc	aaa	ctc	ttc	ttc	gac	gcc	gcg	cac	gcg	ctg	528
Ala	Ala	Glu	His	Gln	Val	Lys	Leu	Phe	Phe	Asp	Ala	Ala	His	Ala	Leu	
				165					170					175		
ggc	tgc	acc	gcc	ggc	ggg	cgg	ccg	gtc	ggc	gcc	ttc	ggc	aac	gcc	gag	576
Gly	Cys	Thr	Ala	Gly	Gly	Arg	Pro	Val	Gly	Ala	Phe	Gly	Asn	Ala	Glu	
			180					185					190			
gtg	ttc	agc	ttc	cac	gcc	acg	aag	gcg	gtc	acc	tcg	ttc	gag	ggc	ggc	624
Val	Phe	Ser	Phe	His	Ala	Thr	Lys	Ala	Val	Thr	Ser	Phe	Glu	Gly	Gly	
		195					200					205				
gcc	atc	gtc	acc	gac	gac	ggg	ctg	ctg	gcc	gac	cgc	atc	cgc	gcc	atg	672
Ala	Ile	Val	Thr	Asp	Asp	Gly	Leu	Leu	Ala	Asp	Arg	Ile	Arg	Ala	Met	
	210					215					220					
cac	aac	ttc	ggg	atc	gca	ccg	gac	aag	ctg	gtg	acc	gat	gtc	ggc	acc	720
His	Asn	Phe	Gly	Ile	Ala	Pro	Asp	Lys	Leu	Val	Thr	Asp	Val	Gly	Thr	

225	230	235	240	
aac ggc aag atg agc gag tgc gcc gcg gcg atg ggc ctc acc tcg ctc				768
Asn Gly Lys Met Ser	Glu Cys Ala Ala	Ala Met Gly Leu Thr Ser Leu		
	245	250	255	
gac gcc ttc gcc gag acc agg gtg cac aac cgc ctc aac cac gcg ctc				816
Asp Ala Phe Ala Glu Thr Arg Val His Asn Arg Leu Asn His Ala Leu				
	260	265	270	
tac tcc gac gag ctc cgc gac gtg cgc ggc ata tcc gtg cac gcg ttc				864
Tyr Ser Asp Glu Leu Arg Asp Val Arg Gly Ile Ser Val His Ala Phe				
	275	280	285	
gat cct ggc gag cag aac aac tac cag tac gtg atc atc tcg gtg gac				912
Asp Pro Gly Glu Gln Asn Asn Tyr Gln Tyr Val Ile Ile Ser Val Asp				
	290	295	300	
tcc gcg gcc acc gcc atc gac cgc gac cag ttg cag gcg atc ctg cga				960
Ser Ala Ala Thr Gly Ile Asp Arg Asp Gln Leu Gln Ala Ile Leu Arg				
	305	310	315	320
gcg gag aag gtt gtg gca caa ccc tac ttc tcc ccc ggg tgc cac cag				1008
Ala Glu Lys Val Val Ala Gln Pro Tyr Phe Ser Pro Gly Cys His Gln				
	325	330	335	
atg cag ccg tac cgg acc gag ccg ccg ctg cgg ctg gag aac acc gaa				1056
Met Gln Pro Tyr Arg Thr Glu Pro Pro Leu Arg Leu Glu Asn Thr Glu				
	340	345	350	
cag ctc tcc gac cgg gtg ctc gcg ctg ccc acc ggc ccc gcg gtg tcc				1104
Gln Leu Ser Asp Arg Val Leu Ala Leu Pro Thr Gly Pro Ala Val Ser				
	355	360	365	
agc gag gac atc cgg cgg gtg tgc gac atc atc cgg ctc gcc gcc acc				1152
Ser Glu Asp Ile Arg Arg Val Cys Asp Ile Ile Arg Leu Ala Ala Thr				
	370	375	380	
agc ggc gag ctg atc aac gcg caa tgg gac cag agg acg cgc aac ggt				1200
Ser Gly Glu Leu Ile Asn Ala Gln Trp Asp Gln Arg Thr Arg Asn Gly				
	385	390	395	400
tcg tga				1206
Ser				

<210> 14  
 <211> 401  
 <212> PRT  
 <213>

<400> 14  
 Met Lys Arg Ala Leu Thr Asp Leu Ala Ile Phe Gly Gly Pro Glu Ala  
 1 5 10 15  
 Phe Leu His Thr Leu Tyr Val Gly Arg Pro Thr Val Gly Asp Arg Glu  
 20 25 30  
 Arg Phe Phe Ala Arg Leu Glu Trp Ala Leu Asn Asn Asn Trp Leu Thr  
 35 40 45

Asn Gly Gly Pro Leu Val Arg Glu Phe Glu Gly Arg Val Ala Asp Leu  
 50 55 60  
 Ala Gly Val Arg His Cys Val Ala Thr Cys Asn Ala Thr Val Ala Leu  
 65 70 75 80  
 Gln Leu Val Leu Arg Ala Ser Asp Val Ser Gly Glu Val Val Met Pro  
 85 90 95  
 Ser Met Thr Phe Ala Ala Thr Ala His Ala Ala Ser Trp Leu Gly Leu  
 100 105 110  
 Glu Pro Val Phe Cys Asp Val Asp Pro Glu Thr Gly Leu Leu Asp Pro  
 115 120 125  
 Glu His Val Ala Ser Leu Val Thr Pro Arg Thr Gly Ala Ile Ile Gly  
 130 135 140  
 Val His Leu Trp Gly Arg Pro Ala Pro Val Glu Ala Leu Glu Lys Ile  
 145 150 155 160  
 Ala Ala Glu His Gln Val Lys Leu Phe Phe Asp Ala Ala His Ala Leu  
 165 170 175  
 Gly Cys Thr Ala Gly Gly Arg Pro Val Gly Ala Phe Gly Asn Ala Glu  
 180 185 190  
 Val Phe Ser Phe His Ala Thr Lys Ala Val Thr Ser Phe Glu Gly Gly  
 195 200 205  
 Ala Ile Val Thr Asp Asp Gly Leu Leu Ala Asp Arg Ile Arg Ala Met  
 210 215 220  
 His Asn Phe Gly Ile Ala Pro Asp Lys Leu Val Thr Asp Val Gly Thr  
 225 230 235 240  
 Asn Gly Lys Met Ser Glu Cys Ala Ala Ala Met Gly Leu Thr Ser Leu  
 245 250 255  
 Asp Ala Phe Ala Glu Thr Arg Val His Asn Arg Leu Asn His Ala Leu  
 260 265 270  
 Tyr Ser Asp Glu Leu Arg Asp Val Arg Gly Ile Ser Val His Ala Phe  
 275 280 285  
 Asp Pro Gly Glu Gln Asn Asn Tyr Gln Tyr Val Ile Ile Ser Val Asp  
 290 295 300  
 Ser Ala Ala Thr Gly Ile Asp Arg Asp Gln Leu Gln Ala Ile Leu Arg  
 305 310 315 320  
 Ala Glu Lys Val Val Ala Gln Pro Tyr Phe Ser Pro Gly Cys His Gln  
 325 330 335  
 Met Gln Pro Tyr Arg Thr Glu Pro Pro Leu Arg Leu Glu Asn Thr Glu  
 340 345 350  
 Gln Leu Ser Asp Arg Val Leu Ala Leu Pro Thr Gly Pro Ala Val Ser  
 355 360 365  
 Ser Glu Asp Ile Arg Arg Val Cys Asp Ile Ile Arg Leu Ala Ala Thr

```

370              375              380
Ser Gly Glu Leu Ile Asn Ala Gln Trp Asp Gln Arg Thr Arg Asn Gly
385              390              395              400

Ser

<210> 15
<211> 6093
<212> DNA
<213> Streptomyces antibioticus

<220>
<221> CDS
<222> (184)..(1386)
<223> /gene= "oleP1"

<220>
<221> CDS
<222> (1437)..(2714)
<223> /function= "glycosylation of 8,
      8a-desoxyoleandolide" /gene= "oleG1"
      /transl_except= (pos: 1437...1439, aa: Met)

<220>
<221> CDS
<222> (2722)..(3999)
<223> /function= "glycosylation of 8,
      8a-desoxyoleandolide" /gene= "oleG2"

<220>
<221> CDS
<222> (4810)..(5967)
<223> /gene= "oleY"

<220>
<221> mat_peptide
<222> (184)

<400> 15
gcatgccccg ctttcctccc cctctccgaa cgcacgcgacg acccgatccc cctcagggac 60
cggtgaagga gcgtgttgca ctcatgcagg acatgcaagg cgtacagccc gaaccagcca 120
gtgtcgaaca cgcgggcgga gcagctcgaa cagagcgaac ggcgcacgga agccgcccag 180
gag atg gag gac agc gaa ctg ggg cgc cgc ctg cag atg ctc cgc ggc 228
  Met Glu Asp Ser Glu Leu Gly Arg Arg Leu Gln Met Leu Arg Gly
    1              5              10              15
atg cag tgg gtc ttc ggc gcc aac ggc gat ccg tac gcc cgg ctg ctg 276
Met Gln Trp Val Phe Gly Ala Asn Gly Asp Pro Tyr Ala Arg Leu Leu
    20              25              30
tgt ggc atg gag gat gac ccg tca cct ttc tac gac gcg ata cgg acc 324
Cys Gly Met Glu Asp Asp Pro Ser Pro Phe Tyr Asp Ala Ile Arg Thr
    35              40              45
ctg ggc gag ctg cac cgg agc agg acc gga gcc tgg gtc acc gcc gac 372
Leu Gly Glu Leu His Arg Ser Arg Thr Gly Ala Trp Val Thr Ala Asp

```

50					55					60						
ccc	ggg	ctc	ggg	ggc	cgc	atc	ctc	gcc	gac	cgg	aag	gct	cgg	tgc	ccg	420
Pro	Gly	Leu	Gly	Gly	Arg	Ile	Leu	Ala	Asp	Arg	Lys	Ala	Arg	Cys	Pro	
	65					70					75					
gaa	ggc	tcg	tgg	ccg	gtg	cgg	gcg	aag	acc	gac	ggg	ctg	gag	cag	tac	468
Glu	Gly	Ser	Trp	Pro	Val	Arg	Ala	Lys	Thr	Asp	Gly	Leu	Glu	Gln	Tyr	
	80				85					90					95	
gtg	ctg	ccc	ggg	cac	cag	gcg	ttc	ctg	cgg	ctg	gag	cgc	gag	gag	gcc	516
Val	Leu	Pro	Gly	His	Gln	Ala	Phe	Leu	Arg	Leu	Glu	Arg	Glu	Glu	Ala	
				100					105					110		
gag	cga	ctg	cgg	gag	gtc	gcg	gcg	ccg	gtg	ctg	ggg	gcc	gcg	gcg	gtc	564
Glu	Arg	Leu	Arg	Glu	Val	Ala	Ala	Pro	Val	Leu	Gly	Ala	Ala	Ala	Val	
			115					120					125			
gac	gcg	tgg	cgc	ccg	ctg	atc	gac	gag	gtc	tgc	gcg	ggg	ctc	gcg	aag	612
Asp	Ala	Trp	Arg	Pro	Leu	Ile	Asp	Glu	Val	Cys	Ala	Gly	Leu	Ala	Lys	
		130					135					140				
ggg	ctg	ccg	gac	acg	ttc	gac	ctg	gtc	gag	gag	tac	gcg	ggg	ctg	gtg	660
Gly	Leu	Pro	Asp	Thr	Phe	Asp	Leu	Val	Glu	Glu	Tyr	Ala	Gly	Leu	Val	
	145					150					155					
ccg	gtc	gag	gtg	ctg	gcg	cgg	atc	tgg	ggc	gtc	ccg	gag	gag	gac	cgc	708
Pro	Val	Glu	Val	Leu	Ala	Arg	Ile	Trp	Gly	Val	Pro	Glu	Glu	Asp	Arg	
	160				165					170					175	
gcc	cgg	ttc	ggg	cgt	gac	tgc	cgg	gcg	ctc	gct	ccc	gcg	ctg	gac	agc	756
Ala	Arg	Phe	Gly	Arg	Asp	Cys	Arg	Ala	Leu	Ala	Pro	Ala	Leu	Asp	Ser	
				180					185					190		
ctc	ctg	tgt	ccc	cag	cag	ttg	gcg	ctg	agc	aag	gac	atg	gcg	tcc	gcc	804
Leu	Leu	Cys	Pro	Gln	Gln	Leu	Ala	Leu	Ser	Lys	Asp	Met	Ala	Ser	Ala	
			195					200					205			
ctg	gag	gac	ctg	cgt	ctc	ctc	ttc	gac	ggc	ctc	gac	gcg	acg	ccg	cgc	852
Leu	Glu	Asp	Leu	Arg	Leu	Leu	Phe	Asp	Gly	Leu	Asp	Ala	Thr	Pro	Arg	
		210					215					220				
ctc	gcc	ggc	ccc	gcc	gac	ggt	gac	gga	acg	gcc	gtg	gcc	atg	ctc	acc	900
Leu	Ala	Gly	Pro	Ala	Asp	Gly	Asp	Gly	Thr	Ala	Val	Ala	Met	Leu	Thr	
	225					230					235					
gtt	ctg	ctc	tgc	acg	gag	ccg	gtg	acc	acg	gcg	atc	ggg	aac	acc	gtg	948
Val	Leu	Leu	Cys	Thr	Glu	Pro	Val	Thr	Thr	Ala	Ile	Gly	Asn	Thr	Val	
	240				245					250					255	
ctc	ggg	ctc	ctt	ccc	ggg	cag	tgg	ccc	gtg	ccc	tgc	acc	ggc	cgg	gtg	996
Leu	Gly	Leu	Leu	Pro	Gly	Gln	Trp	Pro	Val	Pro	Cys	Thr	Gly	Arg	Val	
				260					265					270		
gct	gcc	ggg	cag	gtt	gcc	ggg	cag	gcg	ctg	cac	cgg	gcg	gtg	tgc	tac	1044
Ala	Ala	Gly	Gln	Val	Ala	Gly	Gln	Ala	Leu	His	Arg	Ala	Val	Ser	Tyr	
			275					280					285			
cgt	atc	gcg	acg	cgg	ttc	gcc	cgg	gag	gac	ctg	gag	ttg	gcg	ggc	tgc	1092
Arg	Ile	Ala	Thr	Arg	Phe	Ala	Arg	Glu	Asp	Leu	Glu	Leu	Ala	Gly	Cys	
		290					295					300				

gag gtc aag tcc ggt gac gag gtg gtg gtc ctg gcc gga gcg atc ggc Glu Val Lys Ser Gly Asp Glu Val Val Val Leu Ala Gly Ala Ile Gly 305 310 315	1140
cgg aac gga ccg tcc gca gcc gcc ccg cct gcc cca ccg ggc cca gcg Arg Asn Gly Pro Ser Ala Ala Ala Pro Pro Ala Pro Pro Gly Pro Ala 320 325 330 335	1188
gcc ccg ccc gcc ccg tcg gtc ttc ggt gcc gcc gcc ttc gag aac gcg Ala Pro Pro Ala Pro Ser Val Phe Gly Ala Ala Ala Phe Glu Asn Ala 340 345 350	1236
ctg gcc gaa ccc ctc gtc cgg gct gtg acg gga gcg gcc ctc cag gcc Leu Ala Glu Pro Leu Val Arg Ala Val Thr Gly Ala Ala Leu Gln Ala 355 360 365	1284
ctc gcg gag ggg ccc ccc cgg ctg acg gcg gcg gga ccc gtc gta cga Leu Ala Glu Gly Pro Pro Arg Leu Thr Ala Ala Gly Pro Val Val Arg 370 375 380	1332
cgg cgg cgt tcc cct gtc gtc ggc ggg ctg cac cgg gct ccg gtg gcc Arg Arg Arg Ser Pro Val Val Gly Gly Leu His Arg Ala Pro Val Ala 385 390 395	1380
gcc gca tgagcatcgc gtcgaacggc gcgcgctcgg ccccccgccg gccctgcgc Ala Ala 400	1436
gtg atg atg acc acc ttc gcg gcc aac acg cac ttc cag ccg ctg gtt Met Met Met Thr Thr Phe Ala Ala Asn Thr His Phe Gln Pro Leu Val 405 410 415	1484
ccc ctg gcc tgg gca ctg cgg aca gcc ggg cac gag gtg cgc gtg gtg Pro Leu Ala Trp Ala Leu Arg Thr Ala Gly His Glu Val Arg Val Val 420 425 430	1532
agc cag ccc tcg ctg agc gac gtg gtg acg cag gcg ggg ctc acc tcg Ser Gln Pro Ser Leu Ser Asp Val Val Thr Gln Ala Gly Leu Thr Ser 435 440 445	1580
gtc ccg gtg ggc acc gag gct ccg gtc gag cag ttc gcg gcg acc tgg Val Pro Val Gly Thr Glu Ala Pro Val Glu Gln Phe Ala Ala Thr Trp 450 455 460 465	1628
ggc gac gat gcc tac atc ggc gtc aac agc atc gac ttc acc ggc aac Gly Asp Asp Ala Tyr Ile Gly Val Asn Ser Ile Asp Phe Thr Gly Asn 470 475 480	1676
gac ccc ggc ctg tgg acg tgg ccg tac ctc ctg ggc atg gag acc atg Asp Pro Gly Leu Trp Thr Trp Pro Tyr Leu Leu Gly Met Glu Thr Met 485 490 495	1724
ctg gtg ccg gcc ttc tac gag ttg ctg aac aac gag tcc ttc gtg gac Leu Val Pro Ala Phe Tyr Glu Leu Leu Asn Asn Glu Ser Phe Val Asp 500 505 510	1772
ggc gta gtc gag ttc gcc cgt gac tgg ccg ccc gac ctg gtg atc tgg Gly Val Val Glu Phe Ala Arg Asp Trp Arg Pro Asp Leu Val Ile Trp 515 520 525	1820

gag Glu 530	ccg Pro	ctg Leu	acg Thr	ttc Phe	gcc Ala 535	ggc Gly	gcg Ala	gtg Val	gcg Ala	gcg Ala 540	cgc Arg	gtc Val	acc Thr	ggc Gly 545	gcg Ala	1868
gcc Ala	cac His	gcc Ala	cgg Arg	ctg Leu 550	ccg Pro	tgg Trp	ggg Gly	cag Gln	gag Glu 555	atc Ile	acc Thr	ctg Leu	cgc Arg	ggg Gly 560	cgg Arg	1916
cag Gln	gcg Ala	ttc Phe	ctc Leu 565	gcc Ala	gag Glu	cgt Arg	gcc Ala	ctg Leu 570	caa Gln	ccg Pro	ttc Phe	gag Glu	cac His 575	cgg Arg	gag Glu	1964
gat Asp	ccc Pro	acg Thr 580	gcc Ala	gag Glu	tgg Trp	ctg Leu	ggc Gly 585	cgc Arg	atg Met	ctc Leu	gac Asp	cgg Arg 590	tac Tyr	ggc Gly	tgc Cys	2012
tcg Ser	ttc Phe 595	gac Asp	gag Glu	gag Glu	atg Met	gtc Val 600	acc Thr	ggg Gly	cag Gln	tgg Trp	acc Thr 605	atc Ile	gac Asp	acg Thr	ctg Leu	2060
ccg Pro 610	cgc Arg	agc Ser	atg Met	cgg Arg	ctg Leu 615	gag Glu	ctg Leu	tcc Ser	gag Glu 620	gag Glu	ctg Leu	cgc Arg	acc Thr	ctg Leu 625	gac Asp	2108
atg Met	cgg Arg	tac Tyr	gtg Val 630	ccg Pro	tac Tyr	aac Asn	gga Gly	ccg Pro	gcg Ala 635	gtc Val	gta Val	ccc Pro	ccc Pro	tgg Trp 640	gtg Val	2156
tgg Trp	gaa Glu	ccg Pro	tgc Cys 645	gag Glu	cgg Arg	ccc Pro	cgg Arg	gtc Val 650	tgt Cys	ctg Leu	acg Thr	atc Ile	ggc Gly 655	acc Thr	tcc Ser	2204
cag Gln	cgt Arg	gac Asp 660	tcc Ser	ggc Gly	cgg Arg	gac Asp	cat His 665	gtc Val	ccc Pro	ctc Leu	gac Asp	cac His 670	ctg Leu	ctc Leu	gac Asp	2252
tcc Ser 675	ctc Leu	gcc Ala	gac Asp	gtg Val	gac Asp	gcg Ala	gag Glu	atc Ile	gtg Val	gcc Ala	acg Thr 685	ctc Leu	gac Asp	acc Thr	acc Thr	2300
cag Gln 690	cag Gln	gag Glu	cgc Arg	ctg Leu	cgg Arg	ggc Gly	gcg Ala	gcc Ala	ccc Pro	ggc Gly 700	aac Asn	gtc Val	cgg Arg	ctg Leu	gtg Val 705	2348
gac Asp	ttc Phe	gtc Val	ccg Pro	ctg Leu 710	cac His	gcg Ala	ctg Leu	atg Met	ccg Pro 715	acc Thr	tgc Cys	tcg Ser	gcg Ala	atc Ile 720	gtg Val	2396
cac His	cac His	ggt Gly 725	ggt Gly	ccg Pro	ggc Gly	acg Thr	tgg Trp	tcg Ser	acg Thr	gcg Ala	gcg Ala	ctc Leu	cac His 735	ggc Gly	gtc Val	2444
ccg Pro	cag Gln	atc Ile 740	atc Ile	ctg Leu	gac Asp	acc Thr	tcg Ser	tgg Trp	gac Asp	aca Thr	ccg Pro	gtg Val 750	cgg Arg	gcg Ala	cag Gln	2492
cgc Arg	atg Met 755	cag Gln	caa Gln	ctc Leu	ggg Gly	gcg Ala	ggc Gly 760	ctg Leu	tcg Ser	atg Met	ccg Pro 765	gtg Val	ggg Gly	gaa Glu	ctg Leu	2540
ggc Glu	gtc Glu	gag Glu	gcg Glu	ctg Glu	cgg Glu	gac Glu	cgg Glu	gtc Glu	ctg Glu	cgg Glu	ctg Glu	ctg Glu	ggg Glu	gag Glu	ccg Glu	2588

Gly	Val	Glu	Ala	Leu	Arg	Asp	Arg	Val	Leu	Arg	Leu	Leu	Gly	Glu	Pro		
770					775					780					785		
gag	ttc	cgc	gcg	ggc	gcc	gag	cgg	atc	cgg	gcc	gag	atg	ctc	gcg	atg	2636	
Glu	Phe	Arg	Ala	Gly	Ala	Glu	Arg	Ile	Arg	Ala	Glu	Met	Leu	Ala	Met		
				790					795					800			
ccc	gcc	ccc	ggt	gac	gtc	gta	cgg	gac	ctg	gaa	cga	ctc	acc	gcg	gag	2684	
Pro	Ala	Pro	Gly	Asp	Val	Val	Pro	Asp	Leu	Glu	Arg	Leu	Thr	Ala	Glu		
			805					810					815				
cat	gcc	acc	ggc	gcg	atg	gcg	gga	agg	cgg	tgagacg		atg	cgc	gta	ctg	2733	
His	Ala	Thr	Gly	Ala	Met	Ala	Gly	Arg	Arg			Met	Arg	Val	Leu		
		820					825							830			
ctg	acc	tgc	ttc	gcc	aac	gac	acc	cac	ttc	cac	ggg	ctg	gtg	ccg	ctg	2781	
Leu	Thr	Cys	Phe	Ala	Asn	Asp	Thr	His	Phe	His	Gly	Leu	Val	Pro	Leu		
			835					840					845				
gcg	tgg	gcg	ctg	cgg	gcc	gcc	ggg	cac	gaa	gtc	cgc	gtg	gcc	agt	cag	2829	
Ala	Trp	Ala	Leu	Arg	Ala	Ala	Gly	His	Glu	Val	Arg	Val	Ala	Ser	Gln		
			850				855						860				
ccc	gcc	ctg	tcc	gac	acg	atc	acc	caa	gcg	gga	ctg	acc	gcg	gtg	ccc	2877	
Pro	Ala	Leu	Ser	Asp	Thr	Ile	Thr	Gln	Ala	Gly	Leu	Thr	Ala	Val	Pro		
			865			870					875						
gtg	ggc	cgg	gac	acc	gcc	ttc	ctg	gag	ctg	atg	ggg	gag	atc	ggc	gcg	2925	
Val	Gly	Arg	Asp	Thr	Ala	Phe	Leu	Glu	Leu	Met	Gly	Glu	Ile	Gly	Ala		
					885					890				895			
gac	gtc	cag	aag	tac	tcc	acc	ggc	atc	gac	ctg	ggc	gtc	cgc	gcg	gag	2973	
Asp	Val	Gln	Lys	Tyr	Ser	Thr	Gly	Ile	Asp	Leu	Gly	Val	Arg	Ala	Glu		
				900					905					910			
ctg	acg	agc	tgg	gag	tac	ctg	ctc	ggc	atg	cac	acg	acc	ctg	gtg	ccc	3021	
Leu	Thr	Ser	Trp	Glu	Tyr	Leu	Leu	Gly	Met	His	Thr	Thr	Leu	Val	Pro		
			915					920					925				
acg	ttc	tac	tcg	ctg	gtc	aac	gac	gag	cgg	ttc	gtc	gac	ggg	ctc	gtc	3069	
Thr	Phe	Tyr	Ser	Leu	Val	Asn	Asp	Glu	Pro	Phe	Val	Asp	Gly	Leu	Val		
		930					935					940					
gcg	ctg	acc	cgg	gcc	tgg	cgg	ccc	gac	ctc	atc	ctg	tgg	gag	cac	ttc	3117	
Ala	Leu	Thr	Arg	Ala	Trp	Arg	Pro	Asp	Leu	Ile	Leu	Trp	Glu	His	Phe		
			945			950					955						
agc	ttc	gcc	ggg	gcg	ttg	gcg	gcg	cgg	gcc	acc	ggc	acg	ccc	cac	gcc	3165	
Ser	Phe	Ala	Gly	Ala	Leu	Ala	Ala	Arg	Ala	Thr	Gly	Thr	Pro	His	Ala		
					965					970					975		
cgc	gtg	ctg	tgg	ggg	tcg	gac	ctc	atc	gtc	cgg	ttc	cgc	cgg	gac	ttc	3213	
Arg	Val	Leu	Trp	Gly	Ser	Asp	Leu	Ile	Val	Arg	Phe	Arg	Arg	Asp	Phe		
				980					985					990			
ctc	gcg	gag	cgg	gcg	aac	cgg	ccc	gcc	gag	cac	cgc	gag	gac	ccc	atg	3261	
Leu	Ala	Glu	Arg	Ala	Asn	Arg	Pro	Ala	Glu	His	Arg	Glu	Asp	Pro	Met		
			995				1000						1005				
gcg	gag	tgg	ctg	ggc	tgg	gcg	gcc	gaa	cgg	ctg	ggc	tcc	acc	ttc	gac	3309	
Ala	Glu	Trp	Leu	Gly	Trp	Ala	Ala	Glu	Arg	Leu	Gly	Ser	Thr	Phe	Asp		

1010	1015	1020	
gag gag ctg gtg acc ggg cag tgg acg atc gac ccg ctg ccg cgg agc Glu Glu Leu Val Thr Gly Gln Trp Thr Ile Asp Pro Leu Pro Arg Ser 1025 1030 1035			3357
atg cgg ctg ccc acc ggg acg acg acg gtg ccg atg cgg tac gtg ccg Met Arg Leu Pro Thr Gly Thr Thr Thr Val Pro Met Arg Tyr Val Pro 1040 1045 1050 1055			3405
tac aac ggg cgg gcc gtg gtc ccc gca tgg gtc cgg cag cgt gcg cgg Tyr Asn Gly Arg Ala Val Val Pro Ala Trp Val Arg Gln Arg Ala Arg 1060 1065 1070			3453
cgg ccc cgg atc tgc ctg acg ctc ggt gtg tgc gcc cgg cag acc ctg Arg Pro Arg Ile Cys Leu Thr Leu Gly Val Ser Ala Arg Gln Thr Leu 1075 1080 1085			3501
ggc gac ggc gtg tgc ctg gcg gag gtg ctg gcc gcg ctg ggc gac gtg Gly Asp Gly Val Ser Leu Ala Glu Val Leu Ala Ala Leu Gly Asp Val 1090 1095 1100			3549
gac gcg gag atc gtg gcc acg ctg gac gcc tcc cag cgc aag ctc ctg Asp Ala Glu Ile Val Ala Thr Leu Asp Ala Ser Gln Arg Lys Leu Leu 1105 1110 1115			3597
ggg ccg gtg ccg gac aac gtc cgg ctg gtg gac ttc gtg ccc ctg cac Gly Pro Val Pro Asp Asn Val Arg Leu Val Asp Phe Val Pro Leu His 1120 1125 1130 1135			3645
gcc ctg atg ccg acc tgt tgc gcg atc gtg cac cac ggc ggc gcc ggt Ala Leu Met Pro Thr Cys Ser Ala Ile Val His His Gly Gly Ala Gly 1140 1145 1150			3693
acc tgg ctg acg gcc gcc gtc cac ggc gtc ccg cag atc gtc ctc ggt Thr Trp Leu Thr Ala Ala Val His Gly Val Pro Gln Ile Val Leu Gly 1155 1160 1165			3741
gac ctc tgg gac aac ctg ctg cgc gcc ccg cag aca cag gcc gcg ggc Asp Leu Trp Asp Asn Leu Leu Arg Ala Arg Gln Thr Gln Ala Ala Gly 1170 1175 1180			3789
gcg ggc ctg ttc atc cat ccg tcc gag gtc acc gcg gcc ggg ctc ggt Ala Gly Leu Phe Ile His Pro Ser Glu Val Thr Ala Ala Gly Leu Gly 1185 1190 1195			3837
gag ggc gtg cgc cgg gtg ctg acg gac cct tcc atc cgg gcc gcc gca Glu Gly Val Arg Arg Val Leu Thr Asp Pro Ser Ile Arg Ala Ala Ala 1200 1205 1210 1215			3885
cag cgc gtc ccg gac gag atg aat gca gag ccg acg ccg ggc gag gtc Gln Arg Val Arg Asp Glu Met Asn Ala Glu Pro Thr Pro Gly Glu Val 1220 1225 1230			3933
gtc acg gtg ctg gag cgg ctc gcc gcg agc ggc gga cgc gga cga gga Val Thr Val Leu Glu Arg Leu Ala Ala Ser Gly Gly Arg Gly Arg Gly 1235 1240 1245			3981
ggc ggg aac cat gcg ggc tgacacggag ccgaccaccg ggtacgagga Gly Gly Asn His Ala Gly 1250			4029

cgagttcgcc gagatctacg acgccgtgta ccggggcccg ggcaaggact acgccggcga 4089  
 ggcgaaggac gtggcggacc tcgtgcgcga ccgggtgccg gacgcgtcct ccctcctgga 4149  
 cgtggcctgc ggcacgggcg cgcacctgcg gcaattcgcc acgctcttcg acgacgcccg 4209  
 cggctctcga ctgtccgcga gcatgctgga catcgcccgc tcccgcacgc cgggcgtgcc 4269  
 gctgcaccaa ggggacatgc gatccttcga cctggggcca cgcgtctccg cggtcacctg 4329  
 catgttcagc tccgtcggcc acctggccac caccgccgaa ctgcacgcga cgctgcgggtg 4389  
 cttcgcccgg cacaccggc ccggcggcgt ggccgtcatc gaaccgtggt ggttcccga 4449  
 gaccttcacc gacggctacg tggcgggtga catcgtagc gtcgacggcc ggaccatctc 4509  
 ccgggtgtcc cactcggtag gggacggcgg cgccaccgc atggagatcc actacgtgat 4569  
 cgccgacgcc gagcacggc cccggcacct ggctgagcac caccgcatca cgctgttccc 4629  
 gcggcatgcg tacacggccg cgtacgagaa ggcgggctac accgtcgagt acctcgacgg 4689  
 cgggccctcg ggccgggggc tgttcgtcgg caccggacg tgaaccgcc cgcgaccgc 4749  
 ccgatcacc tgctcaacgc cgttcacacg gatcaccgga ccacgcgaag gacctttcac 4809  
 atg tcg tac gac gac cac gcg gtg ctg gaa gcg ata ctg cgg tgc gcc 4857  
 Met Ser Tyr Asp Asp His Ala Val Leu Glu Ala Ile Leu Arg Cys Ala  
 1255 1260 1265  
 gga ggt gac gag cgc ttc ctg ctg aac acc gtc gag gaa tgg gga gcc 4905  
 Gly Gly Asp Glu Arg Phe Leu Leu Asn Thr Val Glu Glu Trp Gly Ala  
 1270 1275 1280 1285  
 gcc gag atc acc gcg gcg ctc gtg gac gag ttg ctg ttc cgc tgc gag 4953  
 Ala Glu Ile Thr Ala Ala Leu Val Asp Glu Leu Leu Phe Arg Cys Glu  
 1290 1295 1300  
 atc ccg cag gtg ggc ggt gag gcg ttc atc ggc ctg gac gtc ctg cac 5001  
 Ile Pro Gln Val Gly Gly Glu Ala Phe Ile Gly Leu Asp Val Leu His  
 1305 1310 1315  
 ggc gcc gac cgg atc agc cat gtg ctg cag gtg acg gac ggc aag ccg 5049  
 Gly Ala Asp Arg Ile Ser His Val Leu Gln Val Thr Asp Gly Lys Pro  
 1320 1325 1330  
 gtc acg tcg gcg gaa ccg gcc ggc cag gaa ctg ggc ggc cgt acc tgg 5097  
 Val Thr Ser Ala Glu Pro Ala Gly Gln Glu Leu Gly Gly Arg Thr Trp  
 1335 1340 1345  
 agt tca cgc tca gcg acc ctc ctg cgg gag ctg ttc ggc ccg ccg tcc 5145  
 Ser Ser Arg Ser Ala Thr Leu Leu Arg Glu Leu Phe Gly Pro Pro Ser  
 1350 1355 1360 1365  
 ggc cgc acc gcg ggg ggc ttc ggc gtc tcc ttc ctg ccc gac ctg cgc 5193  
 Gly Arg Thr Ala Gly Gly Phe Gly Val Ser Phe Leu Pro Asp Leu Arg  
 1370 1375 1380  
 ggc ccg cgg acc atg gag ggc gcg gcc ctg gcc gcc cgc gcc acc aac 5241  
 Gly Pro Arg Thr Met Glu Gly Ala Ala Leu Ala Ala Arg Ala Thr Asn

1385	1390	1395	
gtg gtg ctg cac gcg acg acc aac gag acg ccc cca ctg gac cgg ctg Val Val Leu His Ala Thr Thr Asn Glu Thr Pro Pro Leu Asp Arg Leu 1400 1405 1410			5289
gcc ctg cgc tac gag tcc gac aag tgg ggc ggc gtc cac tgg ttc acc Ala Leu Arg Tyr Glu Ser Asp Lys Trp Gly Gly Val His Trp Phe Thr 1415 1420 1425			5337
ggc cac tac gac cgg cac ctg cgg gcc gtg cgc gac cag gcg gtg cgg Gly His Tyr Asp Arg His Leu Arg Ala Val Arg Asp Gln Ala Val Arg 1430 1435 1440 1445			5385
atc ctg gag atc ggc atc ggc ggc tac gac gac ctg ctg ccg agc ggc Ile Leu Glu Ile Gly Ile Gly Gly Tyr Asp Asp Leu Leu Pro Ser Gly 1450 1455 1460			5433
gcc tca ctg aag atg tgg aag cgc tac ttc ccg cgc ggc ctg gtc ttc Ala Ser Leu Lys Met Trp Lys Arg Tyr Phe Pro Arg Gly Leu Val Phe 1465 1470 1475			5481
ggc gtg gac atc ttc gac agt cgg cgt gcg acc agc cgc gtg tca aga Gly Val Asp Ile Phe Asp Ser Arg Ala Thr Ser Arg Val Ser Arg 1480 1485 1490			5529
cgc tcc gcg gcc cgg cag gac gac ccg gag ttc atg cgc cgc gtc gcc Arg Ser Ala Ala Arg Gln Asp Asp Pro Glu Phe Met Arg Arg Val Ala 1495 1500 1505			5577
gag gag cac ggg ccg ttc gac gtc atc atc gac gac ggc agc cac atc Glu Glu His Gly Pro Phe Asp Val Ile Ile Asp Asp Gly Ser His Ile 1510 1515 1520 1525			5625
aac gca cac atg cgg acg tcg ttc tcg gtg atg ttc ccc cac ctg cgc Asn Ala His Met Arg Thr Ser Phe Ser Val Met Phe Pro His Leu Arg 1530 1535 1540			5673
aac ggc ggc ttc tac gtc atc gag gac acc ttc acc tcc tac tgg ccc Asn Gly Gly Phe Tyr Val Ile Glu Asp Thr Phe Thr Ser Tyr Trp Pro 1545 1550 1555			5721
ggg tac gga ggg cca tcc gga gcc cgg tgc ccg tcc gga aca acc gcg Gly Tyr Gly Gly Pro Ser Gly Ala Arg Cys Pro Ser Gly Thr Thr Ala 1560 1565 1570			5769
ctg gag atg gtc aag gga ctg atc gac tcg gtg cac tac gag gag cgg Leu Glu Met Val Lys Gly Leu Ile Asp Ser Val His Tyr Glu Glu Arg 1575 1580 1585			5817
ccg gac ggc gcg gcc acg gcc gac tac atc gcc agg aac ctc gtc ggg Pro Asp Gly Ala Ala Thr Ala Asp Tyr Ile Ala Arg Asn Leu Val Gly 1590 1595 1600 1605			5865
ctg cac gcc tac caa acg acc tcg tct tcc tcg aga agg gcg atc aac Leu His Ala Tyr Gln Thr Thr Ser Ser Ser Ser Arg Arg Ala Ile Asn 1610 1615 1620			5913
aag gag ggc ggc atc ccc cac acc gtg ccc cgg gag ccg ttc tgg aac Lys Glu Gly Gly Ile Pro His Thr Val Pro Arg Glu Pro Phe Trp Asn 1625 1630 1635			5961

gac aac tagccacggc cgcaaccaga gccggaaacc gcaccactgt ccgcgccacc 6017  
 Asp Asn

tcggaaccac ctccagcaaa ggacacaccg ctgtgaccga tacgcacacc ggaccgacac 6077

cggccgacgc ggtacc 6093

<210> 16  
 <211> 401  
 <212> PRT  
 <213>

<400> 16

Met Glu Asp Ser Glu Leu Gly Arg Arg Leu Gln Met Leu Arg Gly Met  
 1 5 10 15

Gln Trp Val Phe Gly Ala Asn Gly Asp Pro Tyr Ala Arg Leu Leu Cys  
 20 25 30

Gly Met Glu Asp Asp Pro Ser Pro Phe Tyr Asp Ala Ile Arg Thr Leu  
 35 40 45

Gly Glu Leu His Arg Ser Arg Thr Gly Ala Trp Val Thr Ala Asp Pro  
 50 55 60

Gly Leu Gly Gly Arg Ile Leu Ala Asp Arg Lys Ala Arg Cys Pro Glu  
 65 70 75 80

Gly Ser Trp Pro Val Arg Ala Lys Thr Asp Gly Leu Glu Gln Tyr Val  
 85 90 95

Leu Pro Gly His Gln Ala Phe Leu Arg Leu Glu Arg Glu Glu Ala Glu  
 100 105 110

Arg Leu Arg Glu Val Ala Ala Pro Val Leu Gly Ala Ala Ala Val Asp  
 115 120 125

Ala Trp Arg Pro Leu Ile Asp Glu Val Cys Ala Gly Leu Ala Lys Gly  
 130 135 140

Leu Pro Asp Thr Phe Asp Leu Val Glu Glu Tyr Ala Gly Leu Val Pro  
 145 150 155 160

Val Glu Val Leu Ala Arg Ile Trp Gly Val Pro Glu Glu Asp Arg Ala  
 165 170 175

Arg Phe Gly Arg Asp Cys Arg Ala Leu Ala Pro Ala Leu Asp Ser Leu  
 180 185 190

Leu Cys Pro Gln Gln Leu Ala Leu Ser Lys Asp Met Ala Ser Ala Leu  
 195 200 205

Glu Asp Leu Arg Leu Leu Phe Asp Gly Leu Asp Ala Thr Pro Arg Leu  
 210 215 220

Ala Gly Pro Ala Asp Gly Asp Gly Thr Ala Val Ala Met Leu Thr Val  
 225 230 235 240

Leu Leu Cys Thr Glu Pro Val Thr Thr Ala Ile Gly Asn Thr Val Leu





<212> PRT

<213>

<400> 18

Met Arg Val Leu Leu Thr Cys Phe Ala Asn Asp Thr His Phe His Gly  
1 5 10 15  
Leu Val Pro Leu Ala Trp Ala Leu Arg Ala Ala Gly His Glu Val Arg  
20 25 30  
Val Ala Ser Gln Pro Ala Leu Ser Asp Thr Ile Thr Gln Ala Gly Leu  
35 40 45  
Thr Ala Val Pro Val Gly Arg Asp Thr Ala Phe Leu Glu Leu Met Gly  
50 55 60  
Glu Ile Gly Ala Asp Val Gln Lys Tyr Ser Thr Gly Ile Asp Leu Gly  
65 70 75 80  
Val Arg Ala Glu Leu Thr Ser Trp Glu Tyr Leu Leu Gly Met His Thr  
85 90 95  
Thr Leu Val Pro Thr Phe Tyr Ser Leu Val Asn Asp Glu Pro Phe Val  
100 105 110  
Asp Gly Leu Val Ala Leu Thr Arg Ala Trp Arg Pro Asp Leu Ile Leu  
115 120 125  
Trp Glu His Phe Ser Phe Ala Gly Ala Leu Ala Ala Arg Ala Thr Gly  
130 135 140  
Thr Pro His Ala Arg Val Leu Trp Gly Ser Asp Leu Ile Val Arg Phe  
145 150 155 160  
Arg Arg Asp Phe Leu Ala Glu Arg Ala Asn Arg Pro Ala Glu His Arg  
165 170 175  
Glu Asp Pro Met Ala Glu Trp Leu Gly Trp Ala Ala Glu Arg Leu Gly  
180 185 190  
Ser Thr Phe Asp Glu Glu Leu Val Thr Gly Gln Trp Thr Ile Asp Pro  
195 200 205  
Leu Pro Arg Ser Met Arg Leu Pro Thr Gly Thr Thr Thr Val Pro Met  
210 215 220  
Arg Tyr Val Pro Tyr Asn Gly Arg Ala Val Val Pro Ala Trp Val Arg  
225 230 235 240  
Gln Arg Ala Arg Arg Pro Arg Ile Cys Leu Thr Leu Gly Val Ser Ala  
245 250 255  
Arg Gln Thr Leu Gly Asp Gly Val Ser Leu Ala Glu Val Leu Ala Ala  
260 265 270  
Leu Gly Asp Val Asp Ala Glu Ile Val Ala Thr Leu Asp Ala Ser Gln  
275 280 285  
Arg Lys Leu Leu Gly Pro Val Pro Asp Asn Val Arg Leu Val Asp Phe  
290 295 300

Val Pro Leu His Ala Leu Met Pro Thr Cys Ser Ala Ile Val His His  
 305 310 315 320  
 Gly Gly Ala Gly Thr Trp Leu Thr Ala Ala Val His Gly Val Pro Gln  
 325 330 335  
 Ile Val Leu Gly Asp Leu Trp Asp Asn Leu Leu Arg Ala Arg Gln Thr  
 340 345 350  
 Gln Ala Ala Gly Ala Gly Leu Phe Ile His Pro Ser Glu Val Thr Ala  
 355 360 365  
 Ala Gly Leu Gly Glu Gly Val Arg Arg Val Leu Thr Asp Pro Ser Ile  
 370 375 380  
 Arg Ala Ala Ala Gln Arg Val Arg Asp Glu Met Asn Ala Glu Pro Thr  
 385 390 395 400  
 Pro Gly Glu Val Val Thr Val Leu Glu Arg Leu Ala Ala Ser Gly Gly  
 405 410 415  
 Arg Gly Arg Gly Gly Gly Asn His Ala Gly  
 420 425

<210> 19  
 <211> 386  
 <212> PRT  
 <213>

<400> 19

Met Ser Tyr Asp Asp His Ala Val Leu Glu Ala Ile Leu Arg Cys Ala  
 1 5 10 15  
 Gly Gly Asp Glu Arg Phe Leu Leu Asn Thr Val Glu Glu Trp Gly Ala  
 20 25 30  
 Ala Glu Ile Thr Ala Ala Leu Val Asp Glu Leu Leu Phe Arg Cys Glu  
 35 40 45  
 Ile Pro Gln Val Gly Gly Glu Ala Phe Ile Gly Leu Asp Val Leu His  
 50 55 60  
 Gly Ala Asp Arg Ile Ser His Val Leu Gln Val Thr Asp Gly Lys Pro  
 65 70 75 80  
 Val Thr Ser Ala Glu Pro Ala Gly Gln Glu Leu Gly Gly Arg Thr Trp  
 85 90 95  
 Ser Ser Arg Ser Ala Thr Leu Leu Arg Glu Leu Phe Gly Pro Pro Ser  
 100 105 110  
 Gly Arg Thr Ala Gly Gly Phe Gly Val Ser Phe Leu Pro Asp Leu Arg  
 115 120 125  
 Gly Pro Arg Thr Met Glu Gly Ala Ala Leu Ala Ala Arg Ala Thr Asn  
 130 135 140  
 Val Val Leu His Ala Thr Thr Asn Glu Thr Pro Pro Leu Asp Arg Leu  
 145 150 155 160

Ala Leu Arg Tyr Glu Ser Asp Lys Trp Gly Gly Val His Trp Phe Thr  
 165 170 175  
 Gly His Tyr Asp Arg His Leu Arg Ala Val Arg Asp Gln Ala Val Arg  
 180 185 190  
 Ile Leu Glu Ile Gly Ile Gly Gly Tyr Asp Asp Leu Leu Pro Ser Gly  
 195 200 205  
 Ala Ser Leu Lys Met Trp Lys Arg Tyr Phe Pro Arg Gly Leu Val Phe  
 210 215 220  
 Gly Val Asp Ile Phe Asp Ser Arg Arg Ala Thr Ser Arg Val Ser Arg  
 225 230 235 240  
 Arg Ser Ala Ala Arg Gln Asp Asp Pro Glu Phe Met Arg Arg Val Ala  
 245 250 255  
 Glu Glu His Gly Pro Phe Asp Val Ile Ile Asp Asp Gly Ser His Ile  
 260 265 270  
 Asn Ala His Met Arg Thr Ser Phe Ser Val Met Phe Pro His Leu Arg  
 275 280 285  
 Asn Gly Gly Phe Tyr Val Ile Glu Asp Thr Phe Thr Ser Tyr Trp Pro  
 290 295 300  
 Gly Tyr Gly Gly Pro Ser Gly Ala Arg Cys Pro Ser Gly Thr Thr Ala  
 305 310 315 320  
 Leu Glu Met Val Lys Gly Leu Ile Asp Ser Val His Tyr Glu Glu Arg  
 325 330 335  
 Pro Asp Gly Ala Ala Thr Ala Asp Tyr Ile Ala Arg Asn Leu Val Gly  
 340 345 350  
 Leu His Ala Tyr Gln Thr Thr Ser Ser Ser Ser Arg Arg Ala Ile Asn  
 355 360 365  
 Lys Glu Gly Gly Ile Pro His Thr Val Pro Arg Glu Pro Phe Trp Asn  
 370 375 380  
 Asp Asn  
 385

<210> 20  
 <211> 738  
 <212> DNA  
 <213> Streptomyces antibioticus

<220>  
 <221> CDS  
 <222> (1)..(738)  
 <223> /gene= "oleM" /note= "SEQ ID No. 15 from 3992 to 4729"

<220>  
 <221> mat\_peptide  
 <222> (1)

<400> 20

atg	cgg	gct	gac	acg	gag	ccg	acc	acc	ggg	tac	gag	gac	gag	ttc	gcc	48
Met	Arg	Ala	Asp	Thr	Glu	Pro	Thr	Thr	Gly	Tyr	Glu	Asp	Glu	Phe	Ala	
1				5					10					15		
gag	atc	tac	gac	gcc	gtg	tac	cgg	ggc	cgg	ggc	aag	gac	tac	gcc	ggc	96
Glu	Ile	Tyr	Asp	Ala	Val	Tyr	Arg	Gly	Arg	Gly	Lys	Asp	Tyr	Ala	Gly	
			20					25					30			
gag	gcg	aag	gac	gtg	gcg	gac	ctc	gtg	cgc	gac	cgg	gtg	ccg	gac	gcg	144
Glu	Ala	Lys	Asp	Val	Ala	Asp	Leu	Val	Arg	Asp	Arg	Val	Pro	Asp	Ala	
		35					40					45				
tcc	tcc	ctc	ctg	gac	gtg	gcc	tgc	ggc	acg	ggc	gcg	cac	ctg	cgg	cac	192
Ser	Ser	Leu	Leu	Asp	Val	Ala	Cys	Gly	Thr	Gly	Ala	His	Leu	Arg	His	
		50				55					60					
ttc	gcc	acg	ctc	ttc	gac	gac	gcc	cgc	ggc	ctc	gaa	ctg	tcc	gcg	agc	240
Phe	Ala	Thr	Leu	Phe	Asp	Asp	Ala	Arg	Gly	Leu	Glu	Leu	Ser	Ala	Ser	
65					70				75						80	
atg	ctg	gac	atc	gcc	cgc	tcc	cgc	atg	ccg	ggc	gtg	ccg	ctg	cac	caa	288
Met	Leu	Asp	Ile	Ala	Arg	Ser	Arg	Met	Pro	Gly	Val	Pro	Leu	His	Gln	
				85					90					95		
ggg	gac	atg	cga	tcc	ttc	gac	ctg	ggg	cca	cgc	gtc	tcc	gcg	gtc	acc	336
Gly	Asp	Met	Arg	Ser	Phe	Asp	Leu	Gly	Pro	Arg	Val	Ser	Ala	Val	Thr	
			100					105					110			
tgc	atg	ttc	agc	tcc	gtc	ggc	cac	ctg	gcc	acc	acc	gcc	gaa	ctc	gac	384
Cys	Met	Phe	Ser	Ser	Val	Gly	His	Leu	Ala	Thr	Thr	Ala	Glu	Leu	Asp	
		115					120					125				
gcg	acg	ctg	cgg	tgc	ttc	gcc	cgg	cac	acc	cgg	ccc	ggc	ggc	gtg	gcc	432
Ala	Thr	Leu	Arg	Cys	Phe	Ala	Arg	His	Thr	Arg	Pro	Gly	Gly	Val	Ala	
		130				135					140					
gtc	atc	gaa	ccg	tgg	tgg	ttc	ccg	gag	acc	ttc	acc	gac	ggc	tac	gtg	480
Val	Ile	Glu	Pro	Trp	Trp	Phe	Pro	Glu	Thr	Phe	Thr	Asp	Gly	Tyr	Val	
145					150				155						160	
gcg	ggt	gac	atc	gta	cgc	gtc	gac	ggc	cgg	acc	atc	tcc	cgg	gtg	tcc	528
Ala	Gly	Asp	Ile	Val	Arg	Val	Asp	Gly	Arg	Thr	Ile	Ser	Arg	Val	Ser	
				165					170					175		
cac	tcg	gta	cgg	gac	ggc	ggc	gcc	acc	cgc	atg	gag	atc	cac	tac	gtg	576
His	Ser	Val	Arg	Asp	Gly	Gly	Ala	Thr	Arg	Met	Glu	Ile	His	Tyr	Val	
			180					185					190			
atc	gcc	gac	gcc	gag	cac	ggt	ccc	cgg	cac	ctg	gtc	gag	cac	cac	cgc	624
Ile	Ala	Asp	Ala	Glu	His	Gly	Pro	Arg	His	Leu	Val	Glu	His	His	Arg	
		195					200					205				
atc	acg	ctg	ttc	ccg	cgg	cat	gcg	tac	acg	gcc	gcg	tac	gag	aag	gcg	672
Ile	Thr	Leu	Phe	Pro	Arg	His	Ala	Tyr	Thr	Ala	Ala	Tyr	Glu	Lys	Ala	
		210				215					220					
ggc	tac	acc	gtc	gag	tac	ctc	gac	ggc	ggg	ccc	tcg	ggc	cgg	ggg	ctg	720
Gly	Tyr	Thr	Val	Glu	Tyr	Leu	Asp	Gly	Gly	Pro	Ser	Gly	Arg	Gly	Leu	
225					230					235					240	

ttc gtc ggc acc cgg acg  
Phe Val Gly Thr Arg Thr  
245

738

<210> 21  
<211> 246  
<212> PRT  
<213>

<400> 21  
Met Arg Ala Asp Thr Glu Pro Thr Thr Gly Tyr Glu Asp Glu Phe Ala  
1 5 10 15  
Glu Ile Tyr Asp Ala Val Tyr Arg Gly Arg Gly Lys Asp Tyr Ala Gly  
20 25 30  
Glu Ala Lys Asp Val Ala Asp Leu Val Arg Asp Arg Val Pro Asp Ala  
35 40 45  
Ser Ser Leu Leu Asp Val Ala Cys Gly Thr Gly Ala His Leu Arg His  
50 55 60  
Phe Ala Thr Leu Phe Asp Asp Ala Arg Gly Leu Glu Leu Ser Ala Ser  
65 70 75 80  
Met Leu Asp Ile Ala Arg Ser Arg Met Pro Gly Val Pro Leu His Gln  
85 90 95  
Gly Asp Met Arg Ser Phe Asp Leu Gly Pro Arg Val Ser Ala Val Thr  
100 105 110  
Cys Met Phe Ser Ser Val Gly His Leu Ala Thr Thr Ala Glu Leu Asp  
115 120 125  
Ala Thr Leu Arg Cys Phe Ala Arg His Thr Arg Pro Gly Gly Val Ala  
130 135 140  
Ile Glu Pro Trp Trp Phe Pro Glu Thr Phe Thr Asp Gly Tyr Val  
145 150 155 160  
Ala Gly Asp Ile Val Arg Val Asp Gly Arg Thr Ile Ser Arg Val Ser  
165 170 175  
His Ser Val Arg Asp Gly Gly Ala Thr Arg Met Glu Ile His Tyr Val  
180 185 190  
Ile Ala Asp Ala Glu His Gly Pro Arg His Leu Val Glu His His Arg  
195 200 205  
Ile Thr Leu Phe Pro Arg His Ala Tyr Thr Ala Ala Tyr Glu Lys Ala  
210 215 220  
Gly Tyr Thr Val Glu Tyr Leu Asp Gly Gly Pro Ser Gly Arg Gly Leu  
225 230 235 240  
Phe Val Gly Thr Arg Thr  
245

<210> 22  
<211> 19

<212> DNA  
<213>

<220>  
<223> /desc = "oligonucleotide"

<400> 22  
tcctcgatgg agacctgcc 19

<210> 23  
<211> 19  
<212> DNA  
<213>

<220>  
<223> /desc = "oligonucleotide"

<400> 23  
gagaccatgc ccagggagt 19

<210> 24  
<211> 19  
<212> DNA  
<213>

<220>  
<223> /desc = "oligonucleotide"

<400> 24  
tctgggagcc gctcacctt 19

<210> 25  
<211> 19  
<212> DNA  
<213>

<220>  
<223> /desc = "oligonucleotide"

<400> 25  
gacgaggccg aagaggtgg 19

<210> 26  
<211> 19  
<212> DNA  
<213> Streptomyces antibioticus

<220>  
<223> /desc = "oligonucleotide"

<400> 26  
gcacaccgga atggatgcg 19

<210> 27  
<211> 19  
<212> DNA

<213>  
 <220>  
 <223> /desc = "oligonucleotide"  
 <400> 27  
 ccgtcgagct ctgaggtaa 19  
  
 <210> 28  
 <211> 19  
 <212> DNA  
 <213>  
 <220>  
 <223> /desc = "oligonucleotide"  
 <400> 28  
 gcccagagccg cacgtgcgt 19  
  
 <210> 29  
 <211> 20  
 <212> DNA  
 <213>  
 <220>  
 <223> /desc = "oligonucleotide"  
 <400> 29  
 tgcacgcgct gctgccgacc 20  
  
 <210> 30  
 <211> 20  
 <212> DNA  
 <213>  
 <220>  
 <223> /desc = "oligonucleotide"  
 <400> 30  
 ttggcgaagt cgaccaggtc 20  
  
 <210> 31  
 <211> 23  
 <212> DNA  
 <213>  
 <220>  
 <223> /desc = "oligonucleotide"  
 <400> 31  
 gccgctcggc acggtgaact tca 23  
  
 <210> 32  
 <211> 24  
 <212> DNA  
 <213>

<220>  
 <223> /desc = "oligonucleotide"  
  
 <400> 32  
 atgcgcgtcg tcttctcctc catg 24  
  
 <210> 33  
 <211> 21  
 <212> DNA  
 <213>  
  
 <220>  
 <223> /desc = "oligonucleotide"  
  
 <400> 33  
 tcatcgtggt tctctccttc c 21  
  
 <210> 34  
 <211> 23  
 <212> DNA  
 <213>  
  
 <220>  
 <223> /desc = "oligonucleotide"  
  
 <400> 34  
 ggaattcatg accacgaccg atc 23  
  
 <210> 35  
 <211> 28  
 <212> DNA  
 <213>  
  
 <220>  
 <223> /desc = "oligonucleotide"  
  
 <400> 35  
 cgctccaggt gcaatgccgg gtgcaggc 28  
  
 <210> 36  
 <211> 22  
 <212> DNA  
 <213>  
  
 <220>  
 <223> /desc = "oligonucleotide"  
  
 <400> 36  
 gatcacgctc ttcgagcggc ag 22  
  
 <210> 37  
 <211> 21  
 <212> DNA  
 <213>

```

<220>
<223> /desc = "oligonucleotide"

<400> 37
gaactcgggtg gagtcgatgt c 21

<210> 38
<211> 21
<212> DNA
<213>

<220>
<223> /desc = "oligonucleotide"

<400> 38
gttgatcgatc aagacccgca c 21

<210> 39
<211> 22
<212> DNA
<213>

<220>
<223> /desc = "oligonucleotide"

<400> 39
catcgatcaag gagttcgacg gt 22

<210> 40
<211> 25
<212> DNA
<213>

<220>
<223> /desc = "oligonucleotide"

<400> 40
tgatcaggtc catgttcacc acgtt 25

<210> 41
<211> 20
<212> DNA
<213>

<220>
<223> /desc = "oligonucleotide"

<400> 41
gctacgccct ggagagcctg 20

<210> 42
<211> 21
<212> DNA
<213>

<220>

```

<223> /desc = "oligonucleotide"

<400> 42

gtcgcggtcg gagagcacga c

21

<210> 43

<211> 21

<212> DNA

<213>

<220>

<223> /desc = "oligonucleotide"

<400> 43

gccagctcgg cgacgtccat c

21

<210> 44

<211> 19

<212> DNA

<213>

<220>

<223> /desc = "oligonucleotide"

<400> 44

cgacgaggtc gtgcatcag

19

<210> 45

<211> 56

<212> DNA

<213>

<220>

<223> /desc = "oligonucleotide"

<400> 45

aattgatcaa ggtgaacacg gtcatgcgca ggatcctcga gcggaactcc atgggg

56

<210> 46

<211> 56

<212> DNA

<213>

<220>

<223> /desc = "oligonucleotide"

<400> 46

cccatggag ttccgctcga ggatcctgcg catgaccgtg ttcaccttga tcaatt

56

<210> 47

<211> 32

<212> DNA

<213>

<220>  
<223> /desc = "oligonucleotide"  
  
<400> 47  
aactcgggtg agtcgatgtc gtcgctgcgg aa

32

<210> 48  
<211> 27  
<212> DNA  
<213>

<220>  
<223> /desc = "oligonucleotide"

<400> 48  
caatatagga aggatcaaga ggttgac

27

<210> 49  
<211> 39  
<212> DNA  
<213>

<220>  
<223> /desc = "oligonucleotide"

<220>

<400> 49  
tccggagggtg tgctgtcgga cggacttgtc ggtcggaaa

39

<210> 50  
<211> 33  
<212> DNA  
<213>

<220>  
<223> /desc = "oligonucleotide"

<400> 50  
aggagcacta gtgcgggtac tgctgacgtc ctt

33

<210> 51  
<211> 37  
<212> DNA  
<213>

<220>  
<223> /desc = "oligonucleotide"

<400> 51  
gggggatccc atatgcgggt actgctgacg tccttcg

37

<210> 52  
<211> 37  
<212> DNA  
<213>

<220>  
 <223> /desc = "oligonucleotide"  
  
 <400> 52  
 gaaaagatct gccggcgtgg cggcgctga gttcctc 37  
  
 <210> 53  
 <211> 27  
 <212> DNA  
 <213>  
  
 <220>  
 <223> /desc = "oligonucleotide"  
  
 <400> 53  
 agcggcttga tcgtgttgga ccagtac 27  
  
 <210> 54  
 <211> 27  
 <212> DNA  
 <213>  
  
 <220>  
 <223> /desc = "oligonucleotide"  
  
 <400> 54  
 ggcctatgtg gactacgtgt tgaacgt 27  
  
 <210> 55  
 <211> 31  
 <212> DNA  
 <213>  
  
 <220>  
 <223> /desc = "oligonucleotide"  
  
 <400> 55  
 aacgcctcgt cctgcagcgg agacacgaac a 31  
  
 <210> 56  
 <211> 27  
 <212> DNA  
 <213>  
  
 <220>  
 <223> /desc = "oligonucleotide"  
  
 <400> 56  
 ttcgctcccc gatgaacaca actcgta 27  
  
 <210> 57  
 <211> 35  
 <212> DNA  
 <213>

<220>  
<223> /desc = "oligonucleotide"

<400> 57  
gaaggagata tacatatgcg cgtcgtcttc tcttc 35

<210> 58  
<211> 32  
<212> DNA  
<213>

<220>  
<223> /desc = "oligonucleotide"

<400> 58  
cgggatcctc atcgtggttc tctccttctc gc 32

<210> 59  
<211> 32  
<212> DNA  
<213>

<220>  
<223> /desc = "oligonucleotide"

<400> 59  
cgggtaccat gcgcgtcgtc ttctcctcca tg 32

<210> 60  
<211> 29  
<212> DNA  
<213>

<220>  
<223> /desc = "oligonucleotide"

<400> 60  
cgggtacctc atcgtggttc tctccttcc 29

<210> 61  
<211> 13  
<212> PRT  
<213>

<220>  
<221> PEPTIDE  
<222> (1)..(13)  
<223> /note= "SEQ ID No 11 from 38 to 50"

<400> 61  
Val Thr Gly Ala Gly Asp Gly Asp Ala Asp Val Gln Ala  
1 5 10